

EXPERIMENT STATION RECORD.

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EXPERIMENT STATION RECORD.

VOL. 39.

NOVEMBER, 1918.

No. 7.

Cooperation, coordination, and effective organization of scientific effort in the interest of advancing knowledge were dominant notes at the Baltimore meeting of the American Association for the Advancement of Science. The attention given the subject in sessions of various sections and affiliated societies, and the emphasis with which it was presented, mark the development of a new attitude in degree if not in kind, which reflects the larger and more liberal view of the relations and responsibilities of men of science.

Conviction as to the desirability of a closer union of effort and confidence in its feasibility have come in no small measure out of the war. The latter with its appeal and with the universal desire of science to serve in the largest possible measure has tended to break through the reserve of the past and to develop a willingness to pool ideas and efforts in the interest of the common good. Competition has given place in considerable degree to cooperation, and concern for personal advantage has been in a degree subordinated. The National Research Council, by example and stimulation, has served to crystallize this readiness for common service, and resulted in the organization of a considerable amount of well-directed cooperative work around definite problems. The movement set in motion for the war bids fair to have a permanent influence, and the impression left at the Baltimore meeting was of a quite widespread conviction that the interests of scientific progress are beyond those of any individual and should be promoted by a community of effort. This broader outlook may have a future bearing on some types of scientific activity in which agriculture is closely interested.

Without attempting a systematic review of the discussion of this subject in various meetings, the extent of which was remarkable, mention may be made of two or three occasions of special prominence.

An interesting symposium on the present duty of botanists, arranged by the Botanical Society of America and the American Phytopathological Society, centered quite largely on the importance and value of cooperative effort and its relation to systematic progress in the science and its applications. Dr. John M. Coulter maintained that every important problem in synthetic, and that the syn-

thetic view recognizes the necessity of cooperation. While fully admitting the value to botanical science of division into its separate branches, and the development of specialists interested primarily in their branches, he pointed to the inability of these separate branches to solve some of the broad problems, which leads to the necessity of joint effort toward a common end. This led to the importance to the cultivation of the synthetic attitude of mind, as against a less restricted view and interest on the part of specialists.

Prof. H. H. Whetzel reminded his hearers that cooperation and coordination are the very elements of all biological progress, and that while science has discovered and accepted this fact, it has not put it into practice. Both of these speakers pointed to the prevalence of isolation in research, its pursuit from a largely individual standpoint, the laying of much emphasis on priority of discovery, the attempt to develop some dart which might pierce the armor of coworkers, and other evidences of an individualistic attitude. Speaking plainly, the chief obstacles to cooperation were stated to rest in a selfishness of workers, jealousy or distrust of contemporaries, and desire for personal advantage. That cooperation need involve no loss of individual initiative or the subordination of the individual to mere routine activity, was emphasized by these and other speakers, who presented illustrations from recent experiences. That individual, isolated effort does not represent the highest type of efficiency in many cases was shown by some of its effects.

One result of solitary uncorrelated investigation is what was designated as "a débris of data," incomplete in themselves and widely scattered, rather than clear, comprehensive, and conclusive results, competent to settle specific points. Such investigation is scraggy, and its fragmentary contributions have led to a voluminous literature in which the research worker must spend much time laboring in order to determine just what his predecessors and contemporary workers have established before he is in position to add his contribution. Because of the desire to rush into print to establish claims to priority, considerable of this voluminous literature is not only fragmentary but the results were frankly characterized as immature, a product of working in "solitary confinement," or as another has said of an "unorganized, undirected, scientific spirit."

Under this system of unrelated independent effort, as Dr. Coulter pointed out, progress has been too slow and halting. It has been disjointed and unsystematic. It has not gone on as rapidly as it might have done if there had been some measure of coordinated effort, a working together for a common purpose and to a common end, rather than giving major attention to holding a narrow field as a personal preserve. Sometimes this attitude has gone beyond the individual and been an institutional one. With much earnestness Dr. Coulter

declared that such an attitude breeds emphasis on individual glory, that the purpose of research is not self-glorification but the advancement of knowledge, and that personal and institutional exclusiveness should be submerged in union for a great National service.

In urging the stressing of the practical outlook of science, two of the speakers referred to the maintenance of close contacts with agriculture, which embraces so many of the plant problems related to human welfare. The "disarticulation of botany from its applications" was regretted as most unfortunate for both the science and its applications, and to be remedied by broader interests and contacts.

Several speakers went so far as to outline some of the essentials which should characterize the organization of cooperative effort - the voluntary association of individuals for such effort, the union of the co-operators in a project committee, the choosing of a project leader to guide and sustain rather than direct, conferences at which there should be a pooling of results and ideas, and the self-determination of the method of publication. It was made clear also that successful cooperation requires first of all a definite, specific problem; and a number of such topics were enumerated by different speakers which might with advantage be attacked through cooperative understanding. In this connection Dr. B. E. Livingston announced that a cooperative project on the salt requirements of agricultural plants was being launched under the auspices of the biological division of the National Research Council. Participation was invited in this project, which will be recognized as one having fundamental importance in relation to plant growth and nutrition.

At least two speakers quoted from a recently published criticism by Hon. Elihu Root, on the organization of science for research. In this he pointed out that "science has been arranging, classifying, methodizing, simplifying everything except itself;" that while it has made possible the tremendous modern development of the power of organization which has so multiplied the effective power of human effort, "it has organized itself very imperfectly." As to the need and method of such organization he said: "Occasionally a man appears who has the instinct to reject the negligible. A very great mind goes directly to the decisive fact, the determining symptom, and can afford not to burden itself with a great mass of unimportant facts; but there are few such minds even among those capable of real scientific work. All other minds need to be guided away from the useless and towards the useful. That can be done only by the application of scientific method to science itself through the purely scientific process of organizing effort."

No voice was raised against this criticism or objection that it was not merited, but on the contrary it was quoted to emphasize the

weakness of lack of organization and the importance of measures for securing more coordinated effort in certain types of inquiry.

The subject of the organization of science for research was discussed in a special address by Dr. George E. Hale, dealing with the future plans of the National Research Council. Reference was made to the executive order issued last May providing for the perpetuation of the council, and assigning to it the general purpose of stimulating research and arranging for effective cooperation. The latter is perhaps the most important feature of the perpetuated organization as defined, and is the principal means mentioned by which it is to increase scientific knowledge and its applications.

The council is devised as an agency for suggesting lines of research and rallying investigators around specific inquiries—a medium for promoting cooperation and coordination rather than itself a research institution. Its authorization is “to survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.” The aim is “to promote cooperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress;” and furthermore, “to gather and collate scientific and technical information, at home and abroad, in cooperation with governmental and other agencies, and to render such information available.”

In presenting this matter to the association, with tentative plans for an organization to carry out the purpose of the order, Dr. Hale invited suggestions and criticisms from the various branches represented in the association, realizing, as he said, that the successful evolution of such an agency must itself be a cooperative constructive undertaking, combining the outlook and the best thought of all the sciences. Under the broad authority granted, this matter may be one of importance to agricultural institutions and agricultural investigation, as agriculture is one of the arts mentioned in the opening paragraph of the executive order. Evidently the attempt “to secure concentration of effort, minimize duplication, and stimulate progress” is as important in that subject as in any branch of applied science, although it is already receiving considerable attention.

Science grows by accretions, but there is little reason to doubt that this growth may be more regular, systematic, and productive of a more substantial product, if the activity of individual workers is in some measure organized and coordinated. Research, at least in its higher phases, is recognized as essentially an individual product, but it need not be less so because it is cooperative or bears a recognized relation to the work of others. That the individual investigator is

to be guarded and stimulated and not subordinated through joining hands with others is clearly recognized in the executive order mentioned above, which stipulates that "in all cooperative undertakings encouragement is to be given to individual initiative, as fundamentally important to the advancement of science." The effort must therefore be to provide a form of assistance which will coordinate rather than subordinate, and direction which will guide rather than dominate.

It is important to develop a means of linking the sciences so that they will be brought to bear on large problems the solution of which lies beyond the realm of any single branch. This class of problems is especially prominent in agriculture. They need the assistance of specialists in different branches and phases of science, and these specialists need to be brought together around the problems. Instead of encouraging a feeling of self-complacency and self-sufficiency within small divisions of science, emphasis needs to be placed on the interdependence of these divisions and their individual limitations in case of many complex problems, and upon the strength of a union which combines the outlook and the method of attack of the different branches involved. Such a union of effort is best accomplished through conferences which analyze and dissect the problems and construct such a cooperative plan as involves the joining of head and hand.

There is much need, as has been said before, of an organization of research on the basis of subjects rather than of sciences or divisions of sciences. This is especially true in our agricultural inquiry where the problem is the unit and may profitably be attacked as such, rather than isolated fragments being studied and reported upon without definite reference to the question as a whole.

The conditions favorable to a union of effort are in some respects combined to an unusual degree in the agricultural experiment stations. Their organization now largely follows the important divisions of the field of agriculture rather than the elementary sciences; they are close to the large practical questions which need determination; and in very many instances they are confronted by similar conditions and are studying questions common to a considerable group of States. But it can hardly be denied that they are a mark for the criticism expressed in Mr. Root's address. They are largely working independently and separately on like general problems, some of which need themselves to joint effort. They are duplicating experiments on an extensive scale, and often with little knowledge of one another's work or results until such time as they may be published. Because of lack of common plans it is often difficult to harmonize their findings and make the separate experiments supplement one another effectively.

tively. Such a system can hardly fail to be wasteful of money and human effort, and prevents a degree of efficiency and a measure of progress in securing needed information which it ought to be possible to improve upon.

It is a question whether this difficulty is not in the last analysis, quite largely an administrative one. At all events, improvement may very properly and effectually start from that source. It will involve a more intensive study of the station program in relation to specific problems, the trend and promise of long continued lines of experimental work on a local basis, constructive criticism of plans in operation and their competency to give conclusive results, and attempt to see how results line up with those in adjoining States. It will doubtless require some little administrative attention to overcome the individualistic viewpoint, to rally men around specific problems, and to maintain concentration, but these and the general guidance of the course of the station are chief functions and constitute a form of leadership which is more highly essential than ever before.

The war has interrupted and disturbed the station work, and has led to new duties. The administrative force especially has had exacting and imperative tasks added to its already heavy burden of supervision of the various agricultural enterprises of the college. These have left insufficient time at many institutions for the detailed consideration of station affairs. But the period of readjustment which has come is an opportune time for a thorough consideration of plans and future policy for the experiment stations, with adequate provisions for direction and organization of effort.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Industrial and manufacturing chemistry: II, Inorganic, G. MARIN ET AL. (London: Crosby Lockwood & Son, 1917, vols. 1, pp. XIV+496, pls. 5, figs. 271; 2, pp. XVI+482, figs. 167).—This is a supplement to the treatise on organic industrial chemistry, previously noted (E. S. R., 30, p. 610). It includes both American and British practice in inorganic chemistry, the following sections being among those included: Refrigerating and ice-making machinery, liquefaction of gases, technology of water, artificial mineral waters, sulphur, sulphuric acid and other sulphur compounds, salt, hydrochloric acid, sodium sulphate, sodium carbonate, Stassfurt industry, potassium salts, calcium and magnesium salts, gypsum, barium, and strontium salts, compounds of boron, chlorine, chlorates and perchlorates, bleaching powder and hypochlorites, bromine, iodine, hydrofluoric acid, peroxides and peracids, circulation of nitrogen in nature, nitrates, nitric acid, ammonia and ammonium salts, cyanamid, cyanide and prussiate, carbonous oxid, organic and inorganic disinfectants, antiseptics, insecticides, fungicides, sheep dips, artificial manures, aluminum compounds, artificial zeolites or permutite, calcareous cements, clays and allied materials, glasses, enamels, asbestos, mica, rare elements, radioactive substances, etc.

Practical organic and biochemistry, R. H. A. FIMMER (London and New York: Longmans, Green & Co., 1918, rev. ed., pp. XII+646, pl. 1, pgs. 86). For the new edition of this book, previously noted (E. S. R., 25, p. 84), the text has been thoroughly revised, several sections have been rewritten, and some new methods of preparation and analysis have been incorporated.

Factors affecting the composition of plant ashes with special reference to tobacco, O. D. ROBERTS (*Analyst*, 43 (1918), No. 598, pp. 254-259). Tobacco was selected for investigation on account of the influence of the composition of the ash on the burning quality of the tobacco and on account of its relatively large percentage of ash.

It was found that the methods commonly employed in the preparation of plant ash result generally in an ash deficient in carbon dioxide. In order to obtain correct results, it is suggested that the carbon dioxide in such ash should be determined and the mineral constituents calculated on an ash free from combined carbon.

Analytical data are presented showing that, while part of the inorganic chlorine present in tobacco is lost in the production of the ash, the sulphate content is in excess of that originally present as sulphate in the plant.

"In order to differentiate between those constituents present partly in an organic and partly in an inorganic condition, no reliance can be placed on the ash analysis as giving the amounts originally present as inorganic salts, but these latter must be extracted from the plant by water or dilute acids. The organic chlorine, sulphur, and phosphorus are conveniently obtained by the difference between that inorganically combined and the total present in the plant."

The proteoclastic enzymes of yeast and their relationship to autolysis, K. G. CROSBY (Abs. in *Chem. Abs.*, 11 (1917), No. 20, pp. 2815, 2816).—The author has

demonstrated the presence in yeast of three enzymes which are analogous but differ in certain particulars from, the proteolytic enzymes of the animal organism. The enzymes are (1) yeast pepsin, which splits proteins to peptones and for whose action the optimum hydrogen ion concentration is at $\text{PH}=4-4.5$; (2) a yeast trypsin, which does not act on the protein of the yeast but splits certain proteins, such as acid albumin, gelatin, and caseinogen, into peptids and amino acids, and whose optimum action is at $\text{PH}=7$; and (3) a yeast erepsin, which readily splits peptones and polypeptids into amino acids, and which has an optimum action at $\text{PH}=7.8$.

The method employed by the author consisted in following the course of hydrolysis of yeast and other products in media with varying hydrogen ion concentrations, both in the presence and absence of buffer solutions. Determinations were made of the total nitrogen, amino-peptid, and protein nitrogen after varying intervals of autolysis. The action of the various enzymes was also investigated by extracting them from yeast plasmolized by chloroform, the presence of calcium carbonate and dialyzing the extract against distilled water.

A study on autolysis of animal tissues, K. G. DEERBY (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 179-219, figs. 15; *abs. in Chem. Abs.*, 12 (1918), No. 6, p. 1370).—This paper is a study of the influence of the hydrogen ion concentration on autolysis of animal tissues, using similar methods to those noted above in the study of yeast cells.

In the liver, spleen, pancreas, leucocytes, and mucous membrane of the stomach it has been possible to demonstrate the existence of pepsin-like enzymes which split native proteins to peptones and for whose action the optimum hydrogen ion concentration in all cases is at about $\text{pH}=3.5$. This enzyme does not act in alkaline or neutral solutions. In all these tissues it has also been shown that there are proteolytic enzymes of the type of trypsin or erepsin that attack only peptones or peptids and split them into amino acids. The optimum hydrogen ion concentration for these enzymes is at about $\text{pH}=7.8$, and their action is checked in slightly acid solution. Although both types of proteolytic enzymes occur in all tissues studied, in some of them one or the other of the enzymes has been predominant over the others. Unlike the less specialized enzymes, pancreatic trypsin and gastric pepsin can be easily extracted from the cells.

A special study of the autolysis of pancreas and liver showed that the decomposition of these tissues proceeds furthest in a range of pH between 4 and 6, the optimum lying between that of pepsin and trypsin. The explanation is that the autolysis is most rapid and complete when both types of enzymes work simultaneously.

The autodigestion of normal serum through the action of certain chemical agents, I-II, S. YAMAKAWA (*Jour. Expt. Med.*, 27 (1918), No. 6, pp. 656-672, fig. 1).—Two papers are presented.

In the first it is shown that normal serum contains a characteristic process whose activity is revealed through the action of certain chemical activators such as acetone, alcohols, and chloroform. The seroprotease has a thermal resistance similar to that of certain proteolytic enzymes, but is easily destroyed by the action of alcohol or acetone beyond certain limits of concentration and temperature.

"The chemical activators may be removed from the activated serum by means of vacuum, dialysis, or extraction with certain indifferent chemicals without causing a return of the serum to its original nonautolytic state. Once activated by these reagents, the serum remains in the activated state, in spite of the removal of the activators. The ferment is highly sensitive to the reaction

of the medium, being readily inactivated when the reaction exceeds a certain narrow limit toward acid or alkaline. The optimal digestion is obtained with a faintly alkaline or neutral reaction."

In the second paper the relation which this ferment bears to the various fatty and lipoidal substances is considered, and also the existence of an antiferment in serum and its relation to the seroprotease.

It was found that the neutral fats, fatty acids, and lipid bodies of serum seem to play no part in autodigestion. Native serum contains an antienzymic substance closely related to the autolytic serum. It has almost the same thermal resistance as the seroprotease. The seroprotease can be removed from the serum by means of the inorganic adsorbents, but the antienzymic substance remains in the serum.

The author concludes that "the autodigestion of the activated serum is due to the splitting of the serum protein by the proteolytic ferment of the same serum and is brought about by the destruction of the antienzymic substance by the chemical reagents. On the other hand, the digestion products in a mixture of a foreign substrate and guinea-pig serum are derived from the direct digestion of the substrate by the serum ferment. This digestion takes place in spite of the presence of the antiseroprotease. The serum separated from the substrate can no longer produce a split product, but is as actively antienzymic as the original serum and undergoes autodigestion only when treated with acetone or other chemical activators."

On the preparation of ovalbumin and its refractive indexes in solution, A. R. C. HAAS (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 119-125; *abs. in Chem. Abs.*, 12 (1918), No. 49, p. 1982).—In preparing ovalbumin by the method of Osborne and Campbell, previously noted (*E. S. R.*, 12, p. 544), the crystallization of the ovalbumin was found to be dependent upon the hydrogen ion concentration of the globulin-free solution of egg-white crystals, the optimum concentration lying between 10^{-4} and 10^{-5} . The refractive indexes of varying amounts of ovalbumin dissolved in water, in 1 per cent ammonium sulphate, and in various concentrations of sodium hydroxide, measured according to the method described by Robertson (*E. S. R.*, 28, p. 501), were found to follow the law $n - n_0 = a \times c$ (*E. S. R.*, 25, p. 709). The average value for a , the constant expressing the change in the refractive index of the aqueous solvent by the addition of 1 per cent protein, was found to be 0.00177 ± 0.00004 .

A method for preparing pectin, C. H. HUNT (*Science, n. ser.*, 48 (1918), No. 1234, pp. 201, 202; *abs. in Chem. Abs.*, 12 (1918), No. 29, pp. 2999, 2990). The author, at the Washington Experiment Station, has developed a method for the preparation of pectin from waste fruit products, such as pomace, by adding ammonium sulphate to the hot-water extract of the fruit and heating to 70° C. The principle of the method is based upon the fact that pectin as extracted from the pulp or pomace is in a colloidal state and can be readily changed by electrolytes. The electrolyte must be nonpoisonous and must be able to produce a reversible precipitation.

It is stated that the amount of pectin recovered by this method is practically equivalent to that recovered by the alcoholic precipitation method, and that concentration of the pectin extract below the boiling point does not impair the quality of the pectin.

Oilicica oil, a new drying oil, E. R. BOUTON and C. REIS (*Analyst*, 53 (1918), No. 508, pp. 251-254).—The oil is obtained from a Brazilian seed, *oilicica* or *oilizika*, probably *Coccoloba grandifolia*. The kernels contain 62 per cent of an oil which at normal temperature is a semisolid of a yellow color, possessing a heavy odor similar to that of tung oil. The following analytic constants were obtained: Melting point—incipient fusion 21.5° C., complete fusion 65.6° ;

iodin value 179.5; saponification value 188.6; free fatty acids as oleic 5.7 per cent; unsaponifiable matter 0.91 per cent; and specific gravity, at 15.5°, 0.925.

Heat polymerization and oxidation tests and tests with metallic driers tend to show that the oil has remarkable properties which might be utilized in the manufacture of varnish and linoleum.

Investigation of *Chenopodium quinoa*, R. GONZÁLEZ (*Investigación del *Chenopodium quinoa* W. (Boliviana)*. La Paz, Bolivia: [Author], 1917, 2 ed., rev. ed., *enl.*, pp. 45, pls. 11).—This publication discusses *Chenopodium quinoa* under the following topics: History, botanical characteristics, and uses; qualitative and quantitative chemical analyses; nutritive and digestive value; and the bitter principle or saponin. The composition of the seed was as follows: Protein 13.125 per cent, starch 52.82, cellulose 12.2, moisture 12.5, and ash 5.44. The composition of the ash was silica 1.48 per cent, phosphoric anhydride 1.05, calcium oxid 3.01, iron oxid 1.87, magnesium oxid 11.53, and potassium 28.8. The starch was very rapidly digested by saliva. The bitter principle proved to be a saponin which has marked antipyretic properties.

The pungent principles of ginger, II, H. NOMURA (*Sci. Rpts. Tôhoku Imp. Univ.*, ser. 1, 7 (1918), No. 1, pp. 67-77).—Continuing investigations previously noted (E. S. R., 39, p. 412), the author has obtained, among the pungent principles other than zingerone, a phenolic substance boiling at from 175 to 185°C. of molecular formula $C_{15}H_{12}O_3$. The new substance has been named "shogaol" with reference to its phenolic properties and to the specific name *shoga*, which is the Japanese for ginger. Experimental evidence is given showing that it is possibly a phenolic ketone.

Isolation and identification of stachydrin from alfalfa hay, H. STEINBERG (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 1-13; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1993, 1994).—This is a more detailed report of an investigation previously noted (E. S. R., 37, p. 309).

The use of sodium sulphate in the Kjeldahl-Gunning method, C. T. HOWEY and W. G. FRIEDMAN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 600-609).—Analyses are reported from the Oklahoma Experiment Station showing that in the use of sodium sulphate in place of potassium sulphate in nitrogen determinations, as suggested by Latshaw (E. S. R., 36, p. 141), either the anhydrous or the hydrated sodium sulphate may be used, and that the time of clearing is not affected appreciably by the water of crystallization of the sodium sulphate. Nitrogen determinations on oat feed, cottonseed meal, dried blood, and mill-run bran showed that the same results were obtained with 5 gm. of potassium sulphate as with 10 gm.

Ammonia and nitric nitrogen determinations in soil extracts and physiological solutions, B. S. DAVISSON (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 600-605, figs. 3).—The author, at the Ohio Experiment Station, has developed a procedure for determining nitric and ammonia nitrogen on the same sample of soil solution. The method is a modification of Potter and Snyder's application (E. S. R., 33, p. 411) of the Folin aeration method for determining ammonia and of the method for determining nitric nitrogen proposed by Allen.¹ The aeration is conducted in the cold over sodium carbonate and the ammonia determined by distillation with magnesium oxid. The nitric nitrogen is determined by reduction with Devarda's alloy in $\frac{N}{10}$ solution of sodium hydroxid.

The apparatus, solutions, and methods of procedure are described in detail. **Nucleic acid and its analytical examination, A. C. CHAPMAN** (*Anal. Chem.*, 1918, No. 508, pp. 259-263).—The properties of pure plant nucleic acid are

¹ *Jour. Indus. and Engin. Chem.*, 7 (1915), No. 6, pp. 521-529.

described and an outline is given of the procedure to be adopted for the examination of nucleic acid to determine its purity and quality.

On the hydrolysis of proteins in the presence of extraneous materials and on the origin and nature of the "humin" of a protein hydrolysate, R. A. GOSNER (*Science, n. ser.*, 48 (1918), No. 1231, pp. 122-124). This is a criticism of the work of Mellargue, previously noted (*E. S. R.*, 38, p. 613).

The author states in conclusion that "(1) proteins can not be hydrolyzed with 20 per cent hydrochloric acid at atmospheric pressure in the presence of a considerable quantity of carbohydrates without appreciably altering certain of the nitrogen fractions of a Van Slyke analysis, and (2) a Van Slyke analysis applied to feeding stuffs, containing as they do nonprotein nitrogenous compounds, gives no valid index as to the presence or absence of any individual amino acid."

A method for making electrometric titrations of solutions containing protein, J. C. BAKER and L. L. VAN SLYKE (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 137-145, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1983).—The authors at the New York State Experiment Station have devised a method by which numerous electrometric titrations can be accurately performed in one solution in the presence of proteins. The apparatus has the advantage of enabling one to prevent "interference by dissolved oxygen, local chemical action at point where the reagent enters the solution under titration, foaming of solution, deposition of protein on electrode, and interference by bacterial action or hydrolysis."

The apparatus is described in detail with an accompanying diagram.

The rate of color production in alkaline solutions of dextrose and picrate, T. ADDIS and A. E. SHEVYK (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 43-51, figs. 1-3; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1980-1982; *Jour. Soc. Chem. Indust.*, 7 (1918), No. 17, p. 522A).—The authors have shown that "when a solution of dextrose and picrate is heated in the presence of an alkali the rate of production of a color resembling that of sodium picramate increases with increase in the alkali concentration and in the degree and duration of heating.

"Although increase in dextrose concentration leads to an increase in the rate of color production, yet within a range of dextrose concentrations corresponding to those derived from hypoglycemic, normal, and hyperglycemic bloods the rate of color production is different for each concentration and does not change in direct proportion to the change in dextrose concentration. But when an amount of sodium carbonate sufficient to produce a concentration of 10 per cent is added and the heating is continued for 45 minutes at 100° C. in the presence of 0.5 per cent picric acid, the rate of color production in all dextrose concentrations within the above range becomes almost directly proportional to the particular dextrose concentrations used."

A modification of the picrate method for blood sugar determinations, T. ADDIS and A. E. SHEVYK (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 54-59, figs. 3).—Proof is given that the condition suitable for the determination of dextrose dissolved in water applies also to the dextrose in the blood filtrates. The method described is an application of the principle noted in the preceding paper.

Determination of moisture in preserves, jellies, and marmalades, C. N. PELLIZOR (*Jour. Pharm. et Chim.*, 7, ser., 17 (1918), Nos. 8, pp. 266-273; 9, pp. 285-291; 10, pp. 319-326).—A critical discussion is given of the present methods, with an interpretation of results.

The author concludes that drying in an oven for 16 hours at a temperature of 70° C., or on a water bath for 6 hours, is preferable to drying in a vacuum. In view of the errors in the present methods, he considers it advisable to decide

upon a new official method and to determine the maximum limit of moisture obtainable by this method from typical samples.

Determination of useful constituents in preserves, jellies, and marmalades.—Necessity of establishing a precise official method, C. N. PELTRISOT (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 2, pp. 33-41*).—This is a continuation of the discussion of analytical methods for the examination of preserves, noted above.

The author points out that the consistency of the product is a function of the proportion between the solid matter and liquid products, an increase in the amount of sugar in the limits of its solubility increasing the proportion of liquid and in consequence the fluidity. The proportions are, however, the resultant of the respective quantities of the materials first employed (sugar and fruits) and of the more or less prolonged evaporation which they have undergone.

The advisability is suggested of establishing constants showing the proportions of insoluble dry matter, soluble matter, and total dry matter in products of known proportions of sugar and pulp. These figures would then serve as useful indications in detecting adulteration or careless manufacture of the product.

Estimation of shell in cocoa and cacao products, J. L. BAKER and H. F. E. HULTON (*Analyst, 43 (1918), No. 507, pp. 197-204; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 15, p. 438A*). The methods discussed are the levigation process, originally described by Fflsinger (E. S. R., 13, p. 17), the percentage of nitrogen, and the percentage of crude fiber. Analytical data are given which show wide discrepancies in results obtained by the different methods.

The authors conclude that in estimating small differences in shell content the available methods are inadequate.

Analysis of "cocoa teas," J. L. BAKER and H. F. E. HULTON (*Analyst, 43 (1918), No. 507, pp. 189-197; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 15, p. 437A*).—Analytical data are given on the composition of cacao shells, four samples of cocoa teas, and, for purposes of comparison, samples of cacao nibs and alkalized cocoa. The significance of the analytical data is discussed, and conclusions are drawn as to the composition of the samples of cocoa tea. These consist of cacao shells alone or mixed with varying amounts of nibs. They are used as the basis of the beverage which is sold under the name of "cocoa-shell tea."

Cacao "germ," P. A. E. RICHARDS, *Analyst, 43 (1918), No. 507, p. 214*.—The following analysis is reported of the cacao germ: Percentages on original germ—moisture 7.2 and fat 3.58; percentages on fat-free dry matter—nitrogen 5.5, fiber 3.65, total mineral matter 7.3, soluble mineral matter 4, alkalinity of latter as K_2O 1.69, cold-water extract 28.7, and levigation 33.3. The Zeiss butyro-refractometer reading of the fat was 66 scale divisions at 35° C.

Additive factors for the calculation of fat in milk from the specific gravity and total solids, L. J. HARRIS (*Analyst, 43 (1918), No. 508, pp. 263-267*).—The author proposes a simplified method of calculating the fat in milk from the specific gravity and total solids based on Richmann's formula, $1.2 F = T - \frac{G}{4} - 0.14$, in which T is the percentage of total solids and G the reading of the lactometer. Two sets of factors are given corresponding to values of specific gravity and total solids, respectively. By the direct addition of the two factors the percentage of fat for given values of specific gravity and total solids is obtained. The factors are derived as follows: t (total solids factor) = $\frac{T}{1.2} - 8$, s (specific gravity factor) = $8 - \frac{G}{4.8} + 0.116$.

It is claimed that the comparative compactness of the tables facilitates rapid calculations.

Free lactic acid in sour milk. L. I. VAN SLYKE and J. C. BAKER (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 147-178, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 3, p. 1972; *Jour. Soc. Chem. Indust.*, 37 (1918), No. 17, p. 5261). Continuing investigations on sour milk, previously noted (*E. S. R.*, 34, p. 802), the authors of the New York State Experiment Station have determined the amount of free lactic acid in solution and the amount adsorbed by the casein. A study was also made of the total acidity of sour milk, the coagulation point, and the first sign of souring.

In determining the amount of free lactic acid the following methods were employed with results in good agreement: (1) Measurement of hydrogen ion concentration and application of calculation based on the mass law; (2) partial extraction by ether and application of calculation based on coefficient of distribution; and (3) double electrometric titration with lactic and hydrochloric acids. It was found that free lactic acid does not appear in appreciable amounts in souring milk for about 20 hours after inoculation when there is present 0.1 cc. of $\frac{N}{10}$ acid in 100 cc. of milk. This increases more rapidly in the next few hours, and finally in 48 hours it is about 20 cc. The pH value changes from 6.5 in fresh milk to 4.17 in 48 hours.

In estimating the amount of free lactic acid adsorbed by casein in sour milk four methods were used with consistent results: (1) Measurement of reduction of hydrogen ion concentration caused by adding casein to lactic acid solutions of given concentration; (2) measurement by titration of reduction of acidity caused by adding casein to lactic acid solutions; (3) titration of acidity of sour milk and of separated whey; and (4) extraction of lactic acid in sour milk by ether and in separated whey. About 20 per cent of the free lactic acid in coagulated sour milk is adsorbed by the casein.

In the study of the acidity of milks soured under different conditions, it was found that "the total acidity by titration varied from 70.5 to 220 cc. of 0.1 N acid per 100 cc. of milk; the free lactic acid, from 8.6 to 104 cc.; the acid as lactate, from 51.8 to 92 cc.; the pH value, from 3.7 to 4.59. In milk souring under ordinary conditions, the total acidity by titration varied from 70.5 to 145.5 cc. of 0.1 N acid per 100 cc. of milk; the free lactic acid, from 13.1 to 31.5 cc.; and the pH value from 4.02 to 4.43."

The casein of milk began to coagulate when the pH value reached 4.61 to 4.78. The time from the beginning of coagulation to completion varied from 30 to 60 minutes, during which period the hydrogen ion concentration remained constant, though the acidity by titration increased slightly.

The first physically and easily perceptible sign of souring in milk is considered by the authors to be a characteristic flavor due to the presence of some volatile compound formed in the souring process and not to lactic acid. There is no apparent relation between either the hydrogen ion concentration or the acidity by titration and the first sign of this flavor.

Methods of varnish analysis. W. T. PEARCE (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 77-79).—"Boughton's method, although it is long and tedious, is satisfactory for resins and oils. We believe it gives the actual values to within 1 per cent. The estimation of rosin is accurate to probably 0.75 per cent."

A study of the fatty acids obtained from varnish oils and from varnishes. W. T. PEARCE (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 79-82).—"A study was undertaken with the object of finding methods for estimating China wood and other oils that are being substituted for linseed in oil varnishes.

Tables are given of the indexes of refraction, jelly test, and physical characteristics of acid mixtures prepared by making mixtures of the desired acids, saponifying with alcoholic caustic potash, extracting the liberated acids with ether, and drying the solvent-free acids at 110° C.

The determination of cellulose in wood, B. JOHNSEN and R. W. HOVEY (*Assoc. Soc. Chem. Indus.*, 37 (1918), No. 9, pp. 132T-137T, figs. 3).—The authors discuss the chlorination method of Cross and Bevan for the determination of cellulose in wood and describe the following modification, which is based upon the hydrolysis of the lower carbohydrates and furfural-yielding substances by a mixture of glacial acetic acid and glycerin of sp. gr. 1.26 in the proportion of their molecular weights. This mixture can be heated at from 135 to 140° C. in an open flask, making it possible to carry out the hydrolysis without complicated apparatus. The glycerin causes the fibrous substances to swell, thus facilitating the action of the chlorine gas. The method is as follows:

Two samples, of about 1 gm. each, of air-dry sawdust passing an 80- but not a 100-mesh sieve are weighed exactly, transferred to small flasks, heated on a water bath for $\frac{1}{2}$ hour with alcohol, filtered into specially prepared Gooch crucibles, and washed with hot alcohol. The samples are transferred to 15 cc. flasks, covered with about 75 cc. of a mixture of glycerin and acetic acid, and heated in an oil bath at 135° for 4 hours, using long glass tubes as condensers. The material is then collected in the crucibles and washed well with water, and the crucible after cooling is placed in the chlorination apparatus. The gas is passed through the crucible for 20 minutes, and the free chlorine is removed by washing once with a cold dilute solution of sulphuric acid. The crucibles are then placed in small beakers containing a 3 per cent solution of sodium sulphite and heated on the water bath for $\frac{1}{2}$ hour. After washing the material with hot water and cooling, the chlorination process is repeated three times at intervals of about 15 minutes. After the last treatment with sodium sulphite the fibers are thoroughly washed and dried at 105° to constant weight. The residues are calculated in percentage of bone-dry wood, the moisture of the original sawdust having been determined in a separate sample by drying about 2 gm. of material for 4 hours at 105°.

A discussion, with accompanying tables, is given of the accuracy of the method and of its application in the valuation of woods.

Cellulose, C. F. CROSS, E. J. BEVAN, and C. BEADLE (*London and New York: Longmans, Green & Co., 1918, pp. XIX+348, pls. 14*).—This is a new impression of the book previously noted (*E. S. R.*, 37, p. 112), with a supplementary chapter on recent and current researches.

Home and farm food preservation, W. V. CRUICK (*New York: The Macmillan Co., 1918, pp. XXIV+276, figs. 61*).—This book is divided into three sections: the theory of food preservation, methods of food preservation, and food preservation recipes. The aim is to give the reasons for the various methods of food preservation, to present labor-saving methods, and to give simple and explicit directions that may be easily followed. The material presented is designed primarily for the housewife and farmer, but it is hoped that it will be of value and interest to domestic-science teachers and canning demonstrators.

How to can fruits, vegetables, and meats (*Philadelphia: Curtis Publishing Co., 1917, pp. 24, pls. 2, figs. 3*).—This circular gives directions for canning by the cold-pack method, including information in regard to the use of tin cans, suggestions based on reports of canning difficulties, and a compilation of recipes from various sources.

Preserving and pickling, MARY M. WRIGHT (*Philadelphia: The Penn Publishing Co., 1917, pp. 168*).—This book contains a few general directions for preserv-

ing and pickling and recipes for preserves, conserves, jellies, jams, marmalades, pickled fruits and vegetables, and winter relishes.

Economics in manufacturing in the canning industry. J. H. SIKVORE (*Jour. Amer. Soc. Mech. Engin.*, 40 (1918), No. 8, pp. 686-689; *Amer. Food Jour.*, 13 (1918), No. 8, pp. 424-428, figs. 7).—This paper outlines the general procedure followed in tomato canning and points out the numerous sources of loss. The manufacture of concentrated tomato products, particularly tomato paste, is described.

The conserving of fruits by scientific dehydration. FRANCES E. BATES (*Bull. for Fruit*, 13 (1918), No. 2, pp. 5, 6, fig. 1).—This article describes the process of dehydration of fruits and vegetables and outlines its advantages.

How to dry fruits and vegetables (Philadelphia: Curtis Publishing Co., 1917, pp. 19, figs. 13).—This is a compilation of information from various sources.

Exploitation and utilization of raisin seeds. J. VENTRE (*Prog. Agr. et Ind. (Pl. l'Est-Centre)*, 39 (1918), Nos. 28, pp. 31-38; 29, pp. 53-61, pls. 1, 2, 3, pp. 50-55).—The possible utilization of raisin seeds, particularly for the extraction of edible and illuminating oils, is discussed. Analytical data have been compiled on the amount of seeds available in different parts of France and on the composition of the seeds and of the resulting oil. Methods to be employed in the commercial separation of the seeds from the raisins in the manufacture of the same are discussed.

METEOROLOGY.

Climatic factors in relation to farm management practice. J. W. SMITH (*Amer. Farm Management Assoc. Proc.*, 7 (1916), pp. 63-79).—This article discusses factors determining the climate of different parts of the United States, climatic zones, changes in climate, selection of location with reference to crop selection, and relation of weather to cost of labor, crop risks, insect damage, and marketing.

A short bibliography of the subject is appended.

The relation between temperature and crops. U. A. SEELY (*Rpt. Mich. Acad. Sci.*, 19 (1917), pp. 167-196, pl. 1, figs. 2).—This article reviews previous investigations bearing on the general subject, reports two years' observations on the temperature of leaves of the garden strawberry, and discusses the bearing of such data upon the relation between temperature and plant growth.

It was found that "the plant thermometer readings were usually lower than the air temperatures in the early morning, the minimum readings about 3 to 4° F. lower than the minimum temperatures recorded in the instrument shelter. Differences were more pronounced, of course, when the weather was clear and the air still. The plant cooled off more rapidly in the evening than the air which surrounded it, the 7 p. m. readings usually registering 3 to 4° lower than the dry bulb thermometer. On very warm days, with clear skies, a difference of 8 to 10° was registered at 7 p. m., the plant cooling off much faster than the air. But the most striking difference in temperature occurred during the heat of the day, frequently amounting to 20°, and on a few days the plant thermometer registered 30° higher than the air temperature at the midday observation. On such dates the air was specially clear and still. On but 41 days out of the 304 on which observations were made at midday did the plant thermometer register lower than the air thermometer. These were invariably dark and cloudy, many of them with rain falling at the time of observation."

The 304 simultaneous observations of plant and air temperatures made at midday in 1915 and 1916 were studied "in connection with the cloudiness, in order to determine factors which can be used to give proper values to temperature readings made on clear, partly cloudy, and cloudy days, respectively." It

was found that the average difference in round numbers "between the plant and air temperature in full sunshine was 15° ; in partial sunlight, due to thin clouds or intermittent cloudiness, it was 10° ; and less than 1° when the sky was thickly overcast, so that the sun's disk was invisible."

From these averages the following formula for finding the effective temperature from the recorded thermometer readings is deduced: " $T=t+15\ C+10\ P$. In which T is the sum of the effective temperature for plant growth, t is equal to $m-42X$, m being the sum of all maximum temperatures above 42° during the period in question, and X being the number of such days, C is the number of clear days during the period, and P is the number of partly cloudy days. In other words, the sum of the maximum temperatures above 42° during any period, after 42 has been subtracted from each, is to be increased by 15 for each clear day and 10 for each partly cloudy day during the period. This leaves out of consideration the excess of 1° in temperature during cloudy weather, which is so small that it may well be disregarded."

A list of references to literature cited is given.

Physics of the air, W. J. HUMPHREYS (*Jour. Franklin Inst.*, 184 (1917), Nos. 2, pp. 137-178; 3, pp. 371-408; 4, pp. 527-551; 5, pp. 651-674; 6, pp. 805-836; 185 (1918), Nos. 1, pp. 83-117; 3, pp. 359-372; 4, pp. 517-538; 5, pp. 611-647; 6, pp. 785-824; 186 (1918), Nos. 1, pp. 57-75; 2, pp. 211-232; 3, pp. 341-370; 4, pp. 481-510, figs. 122).—This series of papers is an orderly assemblage of the widely scattered facts and theories relating to the physical phenomena of the earth's atmosphere. Together they constitute a treatise for the student of atmospheres.

Free-air data at Drexel Aerological Station, January to June, 1917, W. R. GREGG (*U. S. Mo. Weather Rev. Sup.* 10 (1918), pp. 101, pls. 7).—The results of 249 observations at an average altitude of 2,959 meters are tabulated and briefly discussed.

SOILS—FERTILIZERS.

War work at Rothamsted, E. J. RUSSELL (*Country Life* [London], 44 (1918), No. 1123, pp. 39, 40).—It is stated that by mutual agreement between the experts representing the Food Production Department of Great Britain, problems relating to soils and fertilizers have been assigned to Rothamsted. Among the problems which have been taken up are the most effective ways of utilizing the available resources of nitrogenous and phosphatic fertilizers and of increasing the supplies of potash; the utilization of the stored-up plant food in grass lands when brought under cultivation, and of controlling insect pests in such lands; the use of root nodule bacteria and leguminous plants to increase the nitrogen supply of the soil; and the management of farmyard manure to prevent waste.

Investigations on the cause of loss in manure and the best way of dealing with it have shown that the problem of managing a manure heap to prevent loss is "to shut out air and keep off rain." Much work is also being done in testing substances of possible fertilizing value, on methods of partial sterilization of soil, and in the study of new methods that may increase crop production, such as electrification. Studies of factors which control the production of wheat are planned.

Soils of Latah County, Idaho, P. P. PETERSON (*Idaho Sta. Bul.* 107 (1918), pp. 3-21, figs. 5).—This bulletin presents a description of the soils of an area surveyed by the Bureau of Soils, of the U. S. Department of Agriculture, as already noted (*E. S. R.*, 37, p. 21), including chemical analyses.

Notes on the agricultural value of the soils of Morocco, M. and L. RIGOTARD (*Rev. Sci. [Paris]*, 56 (1918), No. 15, pp. 468-470).—Results of physical and chemical examinations of a considerable number of representative soils of

Morocco are reported and discussed. It is stated that as a rule the chemical and physical composition of the soils is satisfactory, although generally deficient in phosphoric acid. Many of them are well supplied with lime.

The water reserve in soils in times of drought. J. Dumont (*Rev. Sci. [Paris]*, 56 (1918), No. 16, p. 516).—It was found that the moisture content was influenced to a large extent by manure. Heavy applications of manure incorporated with the soil maintained a considerable percentage of moisture (17.8 per cent) in the surface soil during drought. As a result the crop (sugar beets) on all manured plots made good growth and apparently did not suffer from lack of moisture, while the sugar beets on the unmanured plots suffered much injury from lack of moisture, especially in the earlier stages of growth. The experiments emphasize the importance of an adequate supply of moisture in the surface soil, particularly at the beginning of crop growth.

Rise of temperature on moistening dry soils. C. Rivière (*Rev. Hort. [Paris]*, 46 (1918), No. 5, pp. 85, 86).—Experiments are briefly reported which indicate that the rise and fluctuations of temperature when soils are moistened are much less in a soil which is naturally humil or has previously been pulverized than in an arid soil. In no case, however, are these reactions sufficiently great to injure vegetation except in the early period of growth, and in general they are not considered of appreciable significance in ordinary practice.

The effect of heat on some nitrogenous constituents of soil. R. S. PORRER and R. S. SNYDER (*Soil Sci.*, 5 (1918), No. 3, pp. 197-212, figs. 4). The authors describe investigations conducted at the Iowa Experiment Station to ascertain the effect of heat upon soil nitrogen as nitrate, ammonia, amino acid, and soluble nonprotein nitrogen. The plan of the experiment comprised the heating of 350-gm. samples of Calhoun silt loam, Miami silt loam, and peat soils for 2 hours at 100° and at 200° C. dry heat and in the autoclave at 15 lbs. for 3 hours and at 10 lbs. for 3 hours per day for 3 successive days. Soil heated for 2 hours at 200° and in the autoclave at 10 lbs. for 9 hours was also inoculated with fresh soil emulsion and incubated for 10 and 20 weeks. Tabulated data are presented and fully discussed showing the amounts of the various forms of nitrogen in each soil type before and after the different treatments, and the effect of the treatments on the different forms of nitrogen in each soil as depicted graphically.

The following conclusions were reached with respect to the heat treatments: The amount of ammonia increased with all heat treatments, the higher temperatures giving in general greater increases. At 10 lbs. the increase was greater than at 15 lbs., due to the longer time the soils were heated at 10 lbs. Peat soil heated at 200° contained less ammonia than that heated at any other temperature, due to an excessive volatilization of ammonia at that temperature. The amino-acid nitrogen results in general followed those for ammonia nitrogen, the peat soil again being an exception, not much of any change occurring with any of the treatments. Not much change in the nitrate content resulted from any heat at 100°, but 10 lbs. in the autoclave for 9 hours increased the amount considerably in every soil. Fifteen lbs. for 3 hours caused a somewhat less increase than the 10-lb. treatment. A temperature of 200° caused almost the total disappearance of all nitrates. All heat treatments caused an increase in soluble nonprotein nitrogen, the least change occurring in the peat soil, probably due to a loss of considerable amounts of ammonia from the soil at the higher temperatures.

The following conclusions have been drawn from the results for soil heated at 10 lbs. in the autoclave for 9 hours and that heated to 200° for 2 hours, both later inoculated and incubated as noted above: The three mineral soils heated to 10 lbs. for 9 hours and with 10 weeks' incubation after inoculation

with fresh soil showed an increase of ammonia. Twenty weeks' incubation likewise caused an increase in two cases, though to a less degree than the 10-week period. Twenty weeks' incubation of the Cahoon soil caused a slight decrease in ammonia. The amount of ammonia in the peat soil was not greatly influenced by either incubation period. Ten weeks' incubation caused a decrease in amino nitrogen, there being more at the end of 20 weeks than at the end of 10, and in two of the soils there was more amino nitrogen at the end of the 20 weeks than at the beginning of the experiment. Nitrates were invariably increased by the two incubation periods, the longer period usually giving the greater increase. The amount of nonprotein nitrogen was not materially changed by incubation of the mineral soils which had been heated to 14 lbs. In the peat soil 20 weeks decidedly lessened the amount of this group of compounds. In the mineral soils heated to 200° there was always an increase in soluble nonprotein nitrogen after incubation, the peat soil again showing a decrease for both incubation periods.

Sampling field plats for bacterial analysis. H. A. NOYES (*Abstr. Bact.*, 2 (1918), No. 1, p. 3).—The author maintains that for bacteriological study the most satisfactory results are obtained by sampling field plats in the spots showing the greatest uniformity in chemical tests. Samples were taken at regular intervals, care being exercised to avoid sampling where previous samples may have impaired the cultural practice under investigation. The following conclusions are deemed justified:

The results of bacterial analysis can be correlated with differences in the aeration of the plats more than with any other factor. The smallest variations occur where there is uniform average ranking of the places sampled. Where cultural practice or fertilizer treatment is changing the organic matter in the soil, the change is in the same direction on all spots chosen by this method.

Weight of field soil necessary to be taken for bacterial analysis. H. A. NOYES and E. VOIGT (*Abstr. Bact.*, 2 (1918), No. 1, pp. 3, 4).—In tests made at the Indiana Experiment Station, samples of more than 50 gm. of fresh field soil were not found to increase agreement between triplicate tests, while samples of less than 40 gm. caused large variations in some soils, and samples of less than 25 gm. were deemed entirely unsatisfactory. A standard sample of 50 gm. was adopted by the authors and put with 200 cc. of sterile distilled water to make the first bacterial dilution.

Effect of carbon dioxide gas on bacterial numbers, ammonification, and nitrification. H. A. NOYES and L. YODER (*Abstr. Bact.*, 2 (1918), No. 1, p. 3).—This reports the results of tests with cropped soils subjected to carbon dioxide treatments for a period of nine months under greenhouse conditions. One series of pots received no carbon dioxide, a second received the gas at the rate of 640 cc. per hour per pot for eight hours each day, while a third series was treated continuously at the same rate. The results obtained are given in the following table:

Effect of carbon dioxide gas on bacterial numbers, ammonification, and nitrification.

Factors studied.	First series, no carbon dioxide treatment.	Second series, eight hours carbon dioxide treatment.	Third series, continuous carbon dioxide treatment.
Bacterial numbers. { Air	100	108.2	111.1
{ Hydrogen.....	100	100.1	111.1
Ammonification.....	100	98.2	98.
Nitrates in soil before incubation.....	100	132.3	134.
Nitrates in soil after incubation.....	100	97.4	97.

Isolation and study of the nitrifying organisms. W. M. GIBBS and E. R. FRED (*Abstr. Bact.*, 2 (1918), No. 1, p. 11).—This describes an attempt to isolate *Nitrosomonas* and *Nitrobacter* from a light-colored upland silt soil neutral in reaction, a light-colored silt acid in reaction, and a black garden soil high in organic matter and neutral in reaction. Liquid culture media containing ammonia nitrogen for the nitrite formers and similar media containing nitrate nitrogen for the nitrate formers were inoculated separately with the different soils.

Ammonium sulphate and sodium nitrite gave the most rapid oxidation, the average time required for the oxidation of ammonium sulphate being 7 days and for the oxidation of sodium nitrite about 6 days. All attempts to secure pure cultures by means of enrichment cultures and high dilutions failed. The total number of nitrifying organisms increased with the number of enrichment cultures, while this process was also accompanied by a gain in the number of contaminating forms, including a small coccus and a rod. Washed agar and silicic acid jelly gave the best results for isolation. It was found to be more difficult to isolate *Nitrosomonas* than *Nitrobacter*.

Pure cultures of these organisms were cultivated for a long period of time without any loss of their oxidizing power. The source of the organism apparently had no effect upon its morphology or its physiological activities.

Soil reaction and the presence of *Azotobacter*. P. L. GURVEY (*Science*, n. ser., 48 (1918), No. 1232, pp. 132, 140).—Briefly summarizing the results of culture tests and determinations of the hydrogen ion concentration of the aqueous extract of a large number of soils collected under widely varying conditions, the author concludes that "the absolute reaction is probably the major factor controlling the presence of *Azotobacter* in soils."

The potassium requirements of *Bacillus subtilis*. G. P. KOCH (*Abstr. Bact.*, 1 (1918), No. 1, p. 2).—While maintaining the salts in a 3-salt nutrient solution in the same proportion, the total osmotic concentration of the solution was reduced from 0.1 to 0.00 atmosphere without influencing the amount of ammonia formed from dialyzed peptone by *B. subtilis*. Potassium was found to be essential to the development and activities of the organism, and when there was not sufficient potassium present, magnesium sulphate and calcium phosphate did not affect the ammonia formation. The maximum activity of *B. subtilis* was obtained by the addition of 0.24 mg. potash to the 0.1 mg. already present in the dialyzed peptone. Applying 2.5 and 5 times this amount of potash did not increase the activities of the bacteria.

Copper and zinc as antagonistic agents to the "alkali" salts in soils. C. B. LURMAN and W. F. GERICKE (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 151-170, figs. 2).—Pot experiments with barley grown on Berkeley adobe soil and Oakley blow sand are described in a study of the antagonism of copper and zinc salts to the common alkali salts of soils. Sodium chlorid, sodium sulphate, and sodium carbonate were used in toxic and constant quantities, and copper sulphate, zinc sulphate, copper chlorid, zinc chlorid, and copper carbonate were added in varying amounts within a given series of cultures. Seven series in duplicate were conducted with each soil type, the plants being grown to maturity, harvested, dried at 100° C., and the dry weights of tops and roots and of straw and grain determined in every case. The data for each series of cultures are presented in tabular form and fully discussed. The results may be briefly summarized as follows:

Copper and zinc antagonized sodium chlorid, sodium sulphate, and sodium carbonate in the Berkeley adobe soil, the antagonism being evident even with three successive barley crops used as criteria and when only the metallic ions varied. When four ions were introduced (copper sulphate and sodium chlorid) the an-

tagonism was as fully or even more apparent. Similar evidences of marked antagonism were observed with one barley crop grown on Oakley sand, especially in the case of copper sulphate *v.* sodium chlorid.

"These findings should possess considerable significance in the field reclamation of alkali lands, and particularly in the case of those which do not contain large enough quantities of salts to render them unfit for plant growth by reason of high osmotic pressures in their soil solutions."

Carbonic acid gas in relation to soil acidity changes, H. A. NOYES and L. YONER (*Soil Sci.*, 5 (1918), No. 2, pp. 151-160, pl. 1, figs. 4).—Investigations are described which were "designed primarily to obtain data on the effect of carbon dioxide additions to soil in relation to soil and plant changes." Equal weights of soil were put into paraffined Wagner pots and treated with single (770 parts calcium carbonate per million of dry soil), double, and triple applications of lime and of fertilizers (bone, acid phosphate, dried blood, and sodium nitrate). Distilled water was added to bring the moisture content up to one-half saturation, and small pepper plants were transplanted into the pots. The soil employed showed an acidity of 0.0233 (Hopkins) and 0.1540 (Veitch) parts of calcium carbonate per 100 parts of dry soil at the beginning of the experiment. The work was conducted in the greenhouse from February 4 to December 5, 1916. Each series consisted of 9 pots, 3 receiving no application of carbon dioxide, 3 in which the gas bubbled into the soil daily between 8 a. m. and 4 p. m., and 3 in which it bubbled constantly into the soil. Carbon dioxide applications were made from April 16 to the end of the investigation, the gas being applied at the rate of approximately 650 cc. (under standard conditions) per hour of treatment given. Tabulated data are presented showing the effects of cropping, fertilizing, liming, and of applications of carbon dioxide on soil acidity. The results are discussed, and the following conclusions reached:

Soil kept at one-half its water-holding capacity increased in acidity. Cropping soil kept at one-half its water-holding capacity increased its acidity. This increased acidity of cropped soil was modified by different applications of calcium carbonate, and varied with different fertilizer applications. Carbon dioxide added to cropped soil treated with lime alone or lime and fertilizer increased the acidity of the soil.

"The results of these experiments support chemical theories as to the nature and causes of soil acidity. The changed reactions of this soil toward a neutral salt of a strong base and a strong acid (potassium nitrate) after subjection to the varied conditions of the experiment at least suggest that soil acidity is largely the result of hydrolytic mass action phenomena."

On the "rawness" of subsoils, C. B. LIPMAN (*Science*, n. ser., 46 (1917), No. 1186, pp. 288-290).—The author presents some critical comments on a recent paper on the subject of infertility of subsoils by Alway, McDole, and Rost (E. S. R., 37, p. 20), with particular reference to observations made by Hilgard and Wohltmann on the subsoils of arid regions.

On the basis of his own observations of soil conditions in the citrus and alfalfa growing districts of the Great Valley of California, the author concludes that "subsoils of arid regions are certainly no less 'raw' than those of semi-arid regions, and probably only slightly less so than those of humid regions. If, as seems as yet unproved, inoculated legume seeds fail to develop on humid subsoil material, such failure can not justifiably be attributed, as is done by Alway, McDole, and Rost, to a lack of available phosphoric acid and potash. A lack of available nitrogen probably is sufficient to account for rawness of subsoils. The poor aeration of subsoils, which indirectly results in their rawness, may be accounted for more simply than by Hilgard's explanation of

the washing down of fine particles into the subsoil, which prevents proper aeration."

The "rawness" of subsoils. F. J. ALWAY (*Science, n. s.*, 47 (1918), No. 1208, pp. 196-198).—This is a reply to the criticism noted above.

It is maintained that the subsoils involved in the field observations made by the author and his associates were regarded by them as strictly humid, and it is pointed out that while "the 'rawness' of humid subsoils toward legumes as well as nonlegumes is generally assumed by soil investigators, the burden of [their] paper was to prove that in the case of the loess subsoils of the humid portion of eastern Nebraska there was no rawness toward inoculated legumes. We offered no evidence and made no claims as to the rawness of any subsoils other than those of the loess region of Nebraska."

Handling barnyard manure in eastern Pennsylvania. D. A. BLOOM (*J. S. Dept. Agr., Farmers' Bul.* 278 (1918), pp. 24, figs. 1). The manure yard method of handling manure in Chester County, Pa., is described, in which the stable manure is stored in a walled yard partly or wholly covered and trampled by stock turned into the yard for exercise during the day. The cropping systems followed in the region and the care and utilization of the manure are discussed, and the farm practices of 19 successful farmers who followed the manure yard method are outlined.

Average yields for the State in 1912 amounted to 42.5 bu. per acre for corn, 18 bu. for wheat, 33.1 bu. for oats, and 1.43 tons for hay, as compared with average yields from the 10 selected farms of 85.5 bu. for corn, 29.75 bu. for wheat, 45 bu. for oats, and 2.65 tons for hay. Yields obtained on 378 representative farms in Chester County were also found to be considerably higher than the averages for the State.

Water-holding capacities of bedding materials for live stock. amounts required to bed animals, and amounts of manure saved by their use, J. W. WISEMAN (*Jour. Agr. Research* [U. S.] 14 (1918), No. 4, pp. 187-190). In experiments at the Illinois Experiment Station, here reported, sacks containing 5 to 7 lb. samples of oat straw, cut and uncut, wheat straw, shavings of different kinds, and sawdust were soaked for 12 hours in water, hung up in a room in a barn until dripping had practically ceased (after 5 hours) and weighed. They were weighed again after hanging for 24 hours.

The results indicated that "the common belief that the shavings commonly used for bedding live stock have much greater water-holding capacity than straw is erroneous. Oat straw retained approximately twice as much water as shavings and 15 to 20 per cent more than wheat straw."

In comparative trials of the materials for bedding, in which "no special attempt was made to regulate the amount of bedding used, the men in charge of each barn bedding as usual," it was found that "to keep animals bedded, 49 to 82 per cent more shavings than oat straw and 9 to 18 per cent more wheat straw than oat straw were required. The amount of animal excreta removed from the barn in the manure was about the same regardless of the kind of bedding material used."

Autumn v. spring manuring (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 18 (1918), No. 2, pp. 142-156, pls. 2).—Experiments are described in a comparison of fall and spring applications of manure alone and of manure supplemented with spring applications of commercial fertilizers for potatoes, mangels, and turnips during the period of 1913 to 1916, inclusive.

Fall applications showed average yields of potatoes of about 397.4 bu. per acre for manure alone and 480.6 bu. for manure and commercial fertilizers, as compared with 432.6 and 491.8 bu. for the spring applications. Yields of

wangels amounted to about 31 tons for manure applied alone in the fall and 37.9 tons for manure and commercial fertilizers, while similar applications in the spring showed average yields of 34.1 and 39.6 tons, respectively. Turnip yields amounted to 23.2 and 25.7 tons, respectively, for fall applications of manure and of manure and fertilizers, while spring applications produced yields of 28.5 and 27.7 tons, respectively.

Green manuring (*Rpt. Agr. Dept. Mysore, 1917, pp. 20, 21*).—In a study of the effect of green manure when plowed in with and without the addition of calcic and dolomitic limestone, the results so far are summarized as follows:

"The increase in nitrogen begins about a month after the green manure is plowed in, reaches a maximum about the third month, and then decreases gradually. During the last season the effect of the green manure had almost disappeared by the end of the eighth month. This season the increase is persistent, probably due to the large quantity of green material added. The addition of limestone did not lead to any better retention of nitrogen in the soil, but produced somewhat better yields of green manure and rabi. No difference could be observed in the action of calcic and magnesium limestones. About 45 per cent of nitrogen contained in the green material added in pot experiments, and about 64 per cent in plat experiments, could not be satisfactorily accounted for. The green manured plats showed an improvement over the unmanured ones in texture, water-holding capacity, and humus contents."

The significance of the sulphur in sulphate of ammonia applied to certain soils, C. B. LIPMAN and W. F. GERCKE (*Soil Sci., 5 (1918), No. 1, pp. 81-86*).—Supplementing previous work (E. S. R., 36, p. 726), the authors describe pot experiments conducted, at the California Experiment Station, with barley grown on Oakley blow sand in the greenhouse to determine the rôle of sulphur when used in conjunction with various nitrogenous fertilizers.

Two parallel series of pots were run, one receiving nitrogen at the rate of 1,000 lbs. of dried blood per acre in the form of sulphate of ammonia, nitrate of soda, nitrate of lime, and dried blood; and the second receiving the same nitrogenous fertilizers plus sulphur, as flowers of sulphur, sulphuric acid, and sodium sulphate, in amounts equivalent to the sulphur contained in the sulphate of ammonia application alone. Untreated pots and pots receiving sulphur alone were used as control. Tabulated data, gathered at the end of the growing season, which show the number and height of shoots; the number of heads; and the yields of straw, grain, and roots obtained in the experiments, are fully discussed.

The results are held to indicate that sulphate of ammonia is far superior to the other nitrogenous fertilizers for barley on this soil; that sulphur in all of the forms tested, when supplementing nitrate or dried blood, induced marked increases in barley growth over that obtained from nitrogen alone; and that sulphur alone was practically without effect. In view of these results, the improvement of these and similar soils in the State is deemed to depend chiefly upon the supplying of nitrogen in some readily available form until the nitrogen and organic-matter content of the soil has been increased by green manure and by nitrogen-fixing bacteria. For the best results with annual crops, sulphur in some form, probably as flowers of sulphur, is needed to supplement the nitrogenous fertilizers, unless sulphate of ammonia is used.

Some availability studies with ammonium phosphate and its chemical and biological effects upon the soil, F. E. ALLISON (*Soil Sci., 5 (1918), No. 1, pp. 1-80, figs. 10*).—The author describes extensive investigations with a commercial ammonium phosphate, to determine the relative availability of the ammonia as compared with that in ammonium sulphate, and of the phosphorus as

compared with that in acid phosphate. The experimental work included an analysis of the material employed; biological studies embracing observations on the nitrification of the ammonium phosphate in different soils as compared with other nitrogenous materials and a study of the effect of ammonium phosphate upon the ammonification of organic matter; and various availability experiments in the field and in pot and tumbler trials with different soils in the greenhouse, including observations of the effect on the lime requirement and on germination. The methods employed are described in detail, and the data are presented in tabular form, illustrated graphically, and fully discussed for each phase of the investigation. The principal points brought out by these studies may be briefly summarized as follows:

The commercial ammonium-phosphate fertilizer used contained approximately 13.5 per cent ammonia and 43 per cent phosphoric acid, 96.5 per cent of which was either water or citrate soluble. Ammonium sulphate and ammonium phosphate nitrified at approximately the same rate, while dried blood, cottonseed meal, and tankage were considerably less available, usually in the order named.

A gradual increase in nitrate accumulation occurred in tumblers up until the sixth week in a rich garden soil, and until 8 to 10 weeks in a meadow soil, after the maximum accumulation in the garden soil the decline was quite rapid, showing the importance of nitrate assimilation by *microorganisms*. Calcium carbonate proved to be especially favorable for nitrification, while sodium oxid sometimes caused an actual depression in nitrification with both ammonium sulphate and ammonium phosphate.

Ammonium phosphate increased the rate of ammonification of cottonseed meal, but decreased that of dried blood. Green alfalfa was not appreciably affected by the presence of the fertilizer.

Soil fungi utilized nitrogenous salts in solution in the following order: Ammonium phosphate (showing the best results), ammonium carbonate, ammonium sulphate, urea, ammonium nitrate, and sodium nitrate.

As an average of all conditions the recoveries of nitrogen applied to Norfolk soil, yielding six crops (one of barley, four of buckwheat, and one of corn), were 65.88, 61.10, 43.74, and 41.10 per cent, respectively, for ammonium phosphate, ammonium sulphate, dried blood, and cottonseed meal. On a sassafras soil the average recoveries, in the same order, were 48.30, 50.32, 12.51, and 36.49 per cent. Liming usually increased the recovery of nitrogen. Crop yields were about in the same ratio as the nitrogen recoveries, except that under very acid conditions, frequently ammonium sulphate showed a higher recovery of nitrogen than ammonium phosphate, but a much smaller crop. The comparatively low recovery of the nitrogen added led the author to believe that a considerable amount of nitrogen escaped from the soil as free nitrogen gas of ammonia or was given off from the plants themselves.

The average results for two limed and unlimed soils with two rates of fertilizer applications showed the following increases in lime requirement over weeks, due to the fertilizers applied: Ammonium sulphate, 794 lbs. of calcium (10); ammonium phosphate, 525 lbs.; dried blood, 263 lbs.; and cottonseed meal, 113 lbs.

Pot experiments in sand showed the nitrogen in commercial ammonium phosphate, water-soluble extract of ammonium phosphate, and sodium nitrate to be of practically the same availability. Water-insoluble ammonium phosphate showed only a slightly lower yield than the other forms of nitrogen. Experiments with soils in the greenhouse, as an average, showed little difference in the availability of the phosphorus between ammonium phosphate, acid phos-

phate, and basic slag, while raw rock phosphate gave much smaller increases. On very acid soils acid phosphate was sometimes superior to ammonium phosphate, the acidity not being increased to any great extent, if at all, by the former, while ammonium phosphate increased acidity somewhat. In quarry sand the relative increases over the check were for ammonium phosphate 9.55 gm., acid phosphate 9.5 gm., and raw rock phosphate 3.1 gm.

Ammonium phosphate, on the basis of the amount of nitrogen present, showed about the same toxicity to germination and early growth as ammonium sulphate and less than sodium nitrate or ammonium chloride when applied to soils in high concentrations. Very sandy soils required only about one-tenth as much fertilizer in tumblers to produce a given injury as heavy clay or silt soils. Commercial ammonium phosphate was no more toxic than pure monoammonium phosphate. Liming decreased the growth of young corn plants at the lower rates of application of the fertilizers in the germination experiments, but favored the plants at the higher rates.

Using various combinations of fertilizers did not lessen the injury of individual salts to any extent, if at all. Corn, buckwheat, barley, wheat, and oats were resistant to large applications of fertilizers, while vetch, rape, and cowpeas were relatively susceptible. Under laboratory conditions, using tumblers holding 200 gm. of soil, the injury produced by a given amount of the fertilizers was practically the same whether applied in direct contact with the seed or uniformly mixed with the soil. Under field conditions applications of 100 lbs. of ammonium phosphate per acre in the row did not injure the germination of corn, while 150-lb. applications showed a slight injury.

In concluding, the author states that "ammonium phosphate fertilizer is in general of the same value as an equivalent amount of nitrogen as ammonium sulphate and phosphorus as acid phosphate, and may be used as a substitute for these other forms of plant food. . . . Ammonium phosphate is readily nitrified and utilized by both microorganisms and plants.

"From the standpoint of injurious effects when applied in high concentrations ammonium phosphate is again similar to ammonium sulphate and slightly less toxic than sodium nitrate."

A list of references on the subject is appended.

Experiments with sulphur-phosphate composts conducted under field conditions, J. G. LIPMAN and H. C. McLEAN (*Soil Sci.*, 5 (1918), No. 3, pp. 173-250).—A series of experiments with sulphur-floats-soil compost conducted under field conditions at the New Jersey Experiment Stations are described, and are said to demonstrate the value of the compost in rendering available the phosphorus of floats, thus confirming earlier experiments already reported (*E. S. R.*, 36, pp. 26, 821; 38, p. 817). The studies also indicate the best form of compost from a standpoint of adequate aeration.

Various mixtures of a red silt loam soil and compost, sulphur, floats, and aluminum and ferrous sulphates were placed in porous earthenware pots in the ground with the tops flush with the surface of the soil. One series of pots was covered with waterproof canvas, while corresponding series were left uncovered, and the quantity of available phosphoric acid present in each pot at the beginning of the experiment and after 8, 11, 15, and 20 weeks was calculated in pounds of P_2O_5 per ton of compost. The covered pot containing soil, floats, and sulphur showed the maximum accumulation, 36.86 per cent of the total P_2O_5 , in an available form after 20 weeks, as compared with 20.6 per cent from the corresponding pot left uncovered, the difference being ascribed to leaching. The aluminum and iron salts seemed to bring about a small increase in the uncovered pots, 32.96 per cent of the total P_2O_5 being rendered available with the salts. In the covered series 32.55 per cent was

rendered available with the salts. These results differed from those obtained in the laboratory, thought to be due to the fact that the salts were not added until 5 weeks after the experiment was begun.

In October, 1916, a number of 2-ton composts of varying composition were made up of a red silt loam soil, sulphur, manure, and floats (containing 31.12 per cent P_2O_5) and exposed to the weather. The quantity of available phosphoric acid was determined after 10, 21, 27, 38, and 44 weeks. Marked changes in the availability of the P_2O_5 were obtained only when the floats were composted with sulphur. Sulfidification appeared to be stimulated by the advent of warm weather and to attain a maximum from May 12 to September 3. A compost of 3,400 lbs. of soil, 400 lbs. of floats, and 200 lbs. of sulphur showed the highest yield of available P_2O_5 after 44 weeks, amounting to 75.87 per cent. The addition of 200 lbs. of manure to this compost showed an accumulation of 58.5 per cent of available P_2O_5 . With the quantities of sulphur and floats combined, only 39.65 per cent of the total P_2O_5 was rendered available, while the addition of 200 lbs. of manure resulted in an accumulation of 62.16 per cent of available P_2O_5 . It was concluded from these observations that composts should be made up in warm weather and so constructed as to permit free access of air.

Floats and floats and sulphur were thoroughly mixed with a sassafras gravelly loam soil in plats 4 ft. square to a depth of about 6 in., and the composts were stirred every week to study the effect of composting in shallow piles. The quantity of available P_2O_5 was determined after 6, 15, and 20 weeks. At the end of the period 35.41 lbs. of P_2O_5 per ton of compost had been rendered available in the soil-floats-sulphur combination, as against only 3.26 lbs. for the soil-floats compost. This led to an experiment to determine the best depth for distributing sulphur and floats in the soil in order to obtain a maximum accumulation of available P_2O_5 . Plats 2 ft. square were excavated to depths of 0.5, 1, 2, 3, and 4 in., and the excavations were filled with a mixture of soil, floats, and sulphur. The plats were cultivated by ordinary tillage implements once a week, and the available P_2O_5 was determined at the end of 7 and 14 weeks. The quantities obtained after 14 weeks amounted to 13.4, 22.2, 21.2, 24.95, and 25.9 lbs. per ton of compost, respectively, for the different depths.

Relative efficacy of the different phosphatic manures (*Scot. Jour. Agr.*, 1913, No. 2, pp. 196-198).—The results of one year's experiments at Kilmarnock, Scotland, comparing superphosphate (8 cwt. per acre), basic slag, bone meal, dissolved bone, ground mineral phosphate, guano, etc., on potatoes, are summarized and discussed. The phosphates were applied in quantities furnishing equal amounts of phosphoric acid, in connection with a basic fertilizer supplying potash in the form of sulphate ($2\frac{1}{2}$ cwt. per acre), and nitrogen in the form of ammonium sulphate (2 cwt. per acre). The soil was a uniform medium loam on which a crop of oats had been grown the previous year, but which prior to that time had been in grass for many years and was apparently well supplied with organic matter that no manure was used.

The yields were directly in proportion to the solubility of the phosphate used, the relative order of efficacy being superphosphate, basic slag, and dissolved bone, with mineral phosphate giving much the poorest yield. The superphosphate gave not only the largest yield but also the most profitable return. The general conclusion is drawn that the application of readily available phosphatic fertilizer is a factor of very great importance in increasing the production of potatoes.

The recovery of potash from blast-furnace gases (*Nature* [London], 1913, No. 2530, pp. 147, 148).—This is a review of a paper by R. A. Berry and

D. W. McArthur presented at a meeting of the West of Scotland Iron and Steel Institute, discussing the results of studies by others and recording certain observations by the authors relating particularly to the potash carried by the various by-products from eight coal-fired and one coke-fired steel plants in Scotland.

"The highest yield of dust in the former was only at the rate of 21 tons per annum, as against 300 tons for the latter, and the water-soluble potash averaged 8.86 per cent. The percentage of ash in the tube cleanings varied from 53 to 74 per cent, but these contained a very small percentage of water-soluble potash, the highest being 2.7 per cent."

A record of the proportions of the potash in the charge recovered in the various blast-furnace by-products in case of one plant showed that of the 74 lbs. of potash per ton of pig iron charged, 6.04 lbs. per ton were accounted for, 1.4 lbs. in the spent liquor, 1.7 lbs. in the pitch, 0.2 lb. in the tube cleanings, 0.04 lb. in the flue- and stove-dust, and 2.7 lbs. in the slag. The authors estimate that about 1,667 tons of water-soluble potash are recoverable per annum from 102 Scotch furnaces. No estimate is given of the total amount of insoluble potash.

Bracken as a source of potash, R. A. BERRY, G. W. ROBINSON, and E. J. REISEL (*Jour. Rd. Agr. [London], 25 (1918), No. 1, pp. 1-11*).—Numerous analyses of the ash of bracken at various stages of growth and under different conditions are reported. The results show that young bracken yields the purest ash, which contains more than 50 per cent potash. Fully grown bracken yields a less pure ash, of which about one-third is potash. Dried bracken rapidly loses its potash on exposure to the weather, that left out all winter yielding an ash containing only 2 per cent of potash. The fully grown bracken yields more potash per plant and per acre than the young plant. The younger bracken plants contain about 8 per cent of dry matter, the full grown 49 per cent, and the dry shriveled leaves in autumn more than 70 per cent.

The general conclusions reached are that "wherever bracken can be used as litter or bedding it should be done; not only is this a saving of straw but also an enriching of the farm stock of nitrogen, potash, and organic matter. . . . Bracken that for any reason can not be utilized for hedding may well be burned for its ash, provided always that the operation is so carried out that the ash is not exposed to rain at any time. July and August are the best months."

Shall we recommend the use of magnesium limestone? A. G. McCall (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 41-44*).—Pot experiments made in a greenhouse are briefly described as conducted at the Maryland Experiment Station to study the response of certain soil types to applications of lime and limestone containing different proportions of calcium and magnesium. A red soil (said to be probably Penn loam) which contained approximately 1.15 per cent magnesium and 0.59 per cent calcium was employed. Applications of limestone, dolomitic limestone, dolomitic sand, hydrated oyster shell, hydrated lime, burned lime, and ground oyster shell were made, the composition of the material ranging from practically pure calcium carbonate in the oyster shell to a calcium magnesium ratio of 3:2 in the dolomitic stone. The pots were seeded to red clover, the stand thinned to 6 plants per pot, and the dry weight of the clover determined after a growth of 114 days. Assuming the yield of the untreated check to be unity, the relative value of the different materials is indicated in tabular form and depicted graphically. Burnt lime with 88 per cent calcium oxid and 14 per cent magnesium oxid was highest with a relative yield of 3.7, while the dolomitic sand and dolomitic stone produced relative yields of only 1.41 and 1.61, respectively.

The results are held to indicate that up to a certain maximum the presence of lime magnesium in agricultural lime is beneficial. The fineness of the materials is also deemed an important factor in determining their relative values.

The development of soluble manganese in acid soils as influenced by certain nitrogenous fertilizers. M. J. FENCRESS (*Alabama Col. Sta. Bul. 201* (1918), pp. 37-78, pls. 12).—The author describes investigations dealing with the production of soluble manganese in acid soils and its influence upon plant growth. Considerable quantities of soluble manganese accompanied by a high rate of nitrification were found in soils on the station farm which had been fertilized with dried blood and ammonium sulphate. Corn and sorghum failed to make satisfactory growth when planted in these soils in pots in the greenhouse.

The present studies included field observations and pot and tumbler experiments with the soils and their extracts in the greenhouse. For purposes of comparison observations were also made upon soil samples from the ammonium sulphate plots of the Pennsylvania Experiment Station. The data are tabulated and fully discussed. The conclusions reached may be summarized as follows:

Dried blood and ammonium sulphate produced almost complete sterility in two different soils, while lime added to these soils not only prevented injury but promoted a very vigorous plant growth. Soil which had been made highly unproductive by heavy applications of dried blood still supported nitrification under field conditions. The infertility of this soil is attributed to the presence of manganese in the soil solution, rather than to organic toxic bodies. When dried blood is the source of nitrogen, soluble manganese is believed to be due to the action of nitric acid developed by nitrification, but when ammonium sulphate is the source of nitrogen, nitrification is apparently unnecessary in order to increase the amount of soluble manganese in acid soils.

Reduced growth appeared to be due chiefly to the injury to plant roots from the direct action of manganese, rather than to reduced or altered oxidation of soil organic matter. A part of the injury may also be due to the effect of manganese on the foliage, plants with bleached leaves frequently being found in both soil and water cultures when soluble manganese was present.

Relatively large amounts of manganese were recovered from the soil obtained from the Pennsylvania Experiment Station, and water extracts of this soil were highly toxic to seedling plants. When the manganese was precipitated from these extracts they supported a vigorous plant growth.

Apparently, the relative amount of soluble manganese is of more importance, within certain limits, than is the total amount, the presence of considerable amounts of calcium salts in an extract reducing the toxicity of manganese. Precipitation of a part of the manganese by means of bases was much more effective in reducing toxicity than was dilution. Calcium, sodium, and potassium hydroxids were found to be very effective when used in this way.

A large number of acid soils from Alabama contained soluble manganese, after incubation with dried blood or ammonium sulphate. Soluble manganese was not found in any of the basic soils or in any of the acid soils which had been thoroughly limed. The products of sulfonation appeared to be very effective in dissolving manganese in acid soils.

It is believed that these investigations throw light on the conflicting results obtained by different workers who have used manganese as a fertilizer. Manganese salts applied to basic soils are thought to undergo a rapid change, the manganese going out of solution, but when applied to acid soils, the manganese salt would persist as such, and heavy applications would likely cause injury.

A list of 23 titles, comprising the literature cited, is appended.

[Food and fertilizing value of waste cabbage leaves], J. J. O. DE VRIES (Nederland. Landb. Weekbl., 26 (1917), No. 45, Sup., p. 1; also in *Internat. Inst. Agr.* [Rome], *Internat. Rev. Sci. and Pract. Agr.*, 9 (1918), No. 1, pp. 77-77).—Analyses are reported which show that "(1) the food value of waste cauliflower leaves may be compared to that of brewers' grains, (2) waste leaves of red cabbage have a food value double that of clover hay, and (3) waste leaves of white cabbage have a food value double that of good meadow hay; and that at present prices "the value of such leaves as a food exceeds their value as a fertilizer."

The percentages of fertilizing constituents in dry matter were found to be as follows: Cauliflower leaves, nitrogen 3.6, phosphoric acid 0.54, potash 1.5, and lime 8.2; red cabbage leaves, nitrogen, 2.8, phosphoric acid 0.58, potash 2, and lime 7.8; and white cabbage leaves, nitrogen 2.6, phosphoric acid 0.67, potash 1.6, and lime 8.6 per cent.

AGRICULTURAL BOTANY.

Winter botany, W. TRELEASE (Urbana, Ill.: Author, 1918, pp. XL+334, figs. 326).—This volume supplements the earlier publication of the author (E. S. R. 37, p. 748), and by the use of its keys, illustrations, and brief descriptions it is possible to recognize more than 1,100 species and varieties representing 255 genera of plants in their winter condition. The characters most depended upon are those of the leaf scars, twigs, and buds. The evergreen conifers are not included in this volume, their winter characters not differing essentially from those described in the first volume of this series.

The coefficient of expansion of living tree trunks, C. C. TROWBRIDGE and MADEE WEIL (*Science*, n. ser., 48 (1918), No. 1240, pp. 343-350).—In continuation of a study begun several years ago and previously partially reported upon (E. S. R., 36, p. 129), the authors give the results of an investigation into the expansion of living trunks of trees during two winter seasons, the observations being made on a European linden tree (*Tilia europaea*) and a plane tree (*Platanus orientalis*), both on the campus of Columbia University. During both winters longitudinal and transverse measurements were made, also an extended series of measurements on changes in the circumference of the tree and on frost cracks during the second winter. The observations of the two winters were practically identical.

It was found that above 32° F. there is a slight increase of transverse measurement with a rise of temperature, while below that temperature the changes are far more marked. As the temperature falls below 32°, a very marked transverse contraction is induced. The coefficient of expansion of the linden above freezing is nearly the same as that of dead wood, while below freezing it is about fifty times as great. The transverse change in the tree below freezing was found usually to lag behind change in temperature of the bark by several hours, often as much as 24 hours. When there is a sudden change in the temperature of the bark, the contraction is rapid but not synchronous.

In the case of longitudinal measurements, it was observed that below the freezing temperature there is a minute but definite increase in length with fall of temperature, and above freezing there is an equally minute increase with rise of temperature. At extremely low temperatures, near 0°, there is a small contraction with a fall of temperature, but when the temperature again rises the expansion is extremely rapid, and by the time the temperature is again the same as before the drop the tree is very much longer than previously.

An extended series of measurements was made on the circumference of the jinden tree, and it was found that the expansion and contraction were in the same direction as for the transverse measurements, but this was not always the case. The changes in circumference were found not to be proportional to the transverse measurements. After more than four months, when the temperature was much higher than at the time observations were begun, the circumference of the tree was much smaller than when the first observations were made.

From the measurements on the transverse changes, on the circumference, and on frost cracks, the authors arrive at the conclusion that the frost cracks are caused by a tearing apart of the tissues of the tree due to a great contraction. Both the circumference and the transverse dimensions are much less when the cracks are open than when they are closed, and the one is not proportional to the other. Frost cracks are believed to be due to a difference in the coefficients of radial and tangential contraction of the tree—a difference which sets in at approximately 25°.

Differences in wood of upper and lower sides of branches, P. JACARD (*Rev. Gén. Bot.*, 29 (1917), No. 344, pp. 225-243, pls. 21).—The factors involved in the production of the dorsiventral differences observed in horizontal branches of deciduous trees are described and discussed as regards their causation and probable bearing.

The relation between degree of stimulation and reaction in geotropic movement, with notes on autotropism, H. LUNDGÄRDH (*Bot. Notiser*, No. 2 (1918), pp. 65-120, figs. 13).—Details are given of studies on tropisms of the hypocotyl of *Pisum* as related to the duration and intensity of the stimulations. A correlation was found to exist between length of hypocotyl and geotropic effect, inasmuch as a brief stimulation produced in the shorter specimens relatively greater reaction.

Anatomy of the potato plant, with special reference to the ontogeny of the vascular system, E. F. ARTSCHWAGER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 6, pp. 221-252, pls. 21, figs. 4).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the results are given of an investigation of the anatomy of the potato plant preliminary to a study of the changes brought about by pathological conditions. The author reports a study on the origin, differentiation, and organization of the vascular tissues of the potato, particular attention being given to tuber development. The process of tuber formation as described by Reed (*E. S. R.*, 24, p. 39) has been confirmed and extended by the author, but it is concluded that the pith does not contribute much to the formation of new tissues, it being especially the perimedullary zone which forms most of the tuber. The gross morphology and the anatomy of the different parts of the potato plant are described at considerable length.

Special growth-promoting substances and correlation, C. O. APPLEMAN (*Science*, n. ser., 48 (1918), No. 1239, pp. 319, 320).—From experimental data published elsewhere (*E. S. R.*, 39, p. 521), the author concludes that the potato tuber contains a limited amount of a special growth-promoting substance, and if the amount of tissue surrounding the growing bud is cut too small in preparing tubers for planting there is not enough of this substance available for normal growth. This substance is not believed to have a chemical basis, as is indicated by experiments which showed that if a tuber, before the end of the rest period, is cut into transverse slices the buds on the basal slices will grow out first. If, however, the tuber is cut lengthwise into fractions the growth of basal buds is entirely suppressed. The terminal buds on these fractions do not

produce sprouts until the end of the natural rest period of the whole tuber which in some cases is a month after the basal buds on the transverse slices have begun growth. The basal buds appear to have a shorter rest period than the terminal buds, but they are unable to grow out until their connection with the terminal end of the tuber is severed. From this it is believed that the terminal end of the tuber, even before its buds have grown out, may inhibit the growth of buds more basally situated.

The author suggests that a physiological disease of potatoes called spindling sprout, which is characterized by the production of long, slender, weak sprouts may be due to an abnormally low content of growth-promoting substances in the tubers producing such sprouts.

The chemical composition of the plant as further proof of the close relation between antagonism and cell permeability, D. D. WAYNICK (*Univ. Cal. Publs. Agr. Sci.*, 3 (1918), No. 8, pp. 135-243, pls. 12, figs. 26).—The author has studied the effects of various salt solutions on the chemical constitution of plants, with special reference to a correlation between toxic or antagonistic effects and composition, employing in this work a uniform nutrient solution. The cultures were arranged in series in which the concentration of one salt was constant, while that of a second varied over a wide range. In some series the concentration of the two salt solutions varied, maintaining, however, a constant ratio between the two. The data presented cover the percentages of calcium and magnesium found in plants grown in every culture, with the determinations of potassium, iron, and copper in certain series.

It is stated that the composition of plants grown in different solutions varied widely. Normal growth, approximately that of the controls, was correlated with approximately equal percentages of calcium and magnesium in the plants. Marked decrease of growth was generally correlated with high percentage of these two elements. Absorption rate for any salt seems to be independent of concentration over a wide range. Certain relations are pointed out between the absorption of calcium and magnesium and the presence of iron and zinc salts. Antagonism (as evidenced by growth) is correlated with absorption of the ions. Stimulation accompanied certain concentrations of ferric sulphate or of this compound when accompanied by zinc sulphate. The proportions of the ions were not always the same in tops and in roots. Consideration of the possible effects of changes in concentrations of the various solutions leads to the conclusion that changes in the concentration are secondary in importance to the range of concentrations of the various salts here employed. Apparently growth is constant through widely varying ratios of calcium to magnesium. It is stated that the results in general indicate that antagonistic salt action tends toward the preservation of normal permeability of the plasma membrane in living tissue.

The synergetic action of electrolytes, O. L. RABER (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 12, pp. 682-685, fig. 1).—The author gives results of a study of cases in which a mixture of toxic salts was found to be more harmful than was either constituent, an effect designated by the author as synergy, which was noted in *Laminaria agardhii*. Sodium citrate and sodium chloride were used together in varying proportions and in combination with other salts, giving data some of which are to appear later. Of all the salts tried, citrates gave the most pronounced synergy.

A comparative study of salt requirements for young and for mature buckwheat plants in solution cultures, J. W. SHIVE and W. H. MARTIN (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 4, pp. 151-175, figs. 3).—The results are given of comparative studies made at the New Jersey Experiment Stations on the

salt requirements of young and mature buckwheat plants grown in nutrient solutions having approximately the same total osmotic concentration but differing in the proportions of the component salts. 36 different sets of proportions of monopotassium phosphate, calcium nitrate, and magnesium sulphate being used. Results are reported as obtained from cultures grown in these solutions to the flowering stage and from the flowering stage to the maturity of the plants.

It was found that the highest yield of buckwheat tops and roots obtained in the four weeks following germination was produced by a solution containing the following salt proportions: Potassium phosphate 0.0144 mol., calcium nitrate 0.0052 mol., and magnesium sulphate 0.0300 mol. For the second 4 week period, which included seed production and ripening, the highest yield of tops and roots was obtained in solutions having the salt proportions, potassium phosphate 0.0108 mol., calcium nitrate 0.0130 mol., and magnesium sulphate 0.0100 mol. This indicates that the maximum yield was produced during the later stage of development in a medium having a lower osmotic proportion of potassium phosphate, a much higher proportion of calcium nitrate, and a much lower one of magnesium sulphate than did the medium which produced the highest yield during the early growth period. The values of the cation atomic ratios magnesium : calcium, magnesium : potassium, and calcium : potassium characterizing the solutions which produced the highest yields, and also those which gave the lowest yields, differed markedly for the two different developmental stages of the plant. The amounts of transpiration water loss during each of the two different periods of development were found to indicate in a general way the yields, high transpiration being correlated in a general way with high yields of tops and low transpiration with low yields. For each of the two developmental periods of growth considered low water requirement was associated with high yields of tops and roots and a high water requirement with low yields. No definite correlation was found between the yields of tops and of seeds, such as exist between yields of tops and of roots.

[The alteration and utilization of solar energy by plants]. J. DEWEY SOY (Rev. Gén. Sci., 29 (1918), No. 5, pp. 132-133).—A brief account is given of the occurrence and the functional relations in plants of anthocyanin, flavone, chromogen, and oxidase; of such processes as reduction and hydration; and of the amounts, forms, and utilization of solar energy, including protection therefrom, with recommendations regarding selection of strains having favorable pigmentation and regarding the use of screens as an aid in the utilization of solar energy.

Some problems of evaporation, H. JEFFREYS (Phil. Mag. and Jour. Sci., 6, ser., 35 (1918), No. 207, pp. 270-280).—The author, considering the main problem of evaporation to be practically one of gaseous diffusion, the equation expressing the variation of concentration of water vapor in the air at any time being identical in form with those that represent the conditions for transference of heat and momentum, discusses the effect of conditions in modifying the factors and results concerned in the movement of water particles to or from stomata. The discussion is limited to the physical aspect of stomatal diffusion. Possible complications are discussed.

On transpiration through leaf stomata, J. LARSON (Phil. Mag. and Jour. Sci., 6, ser., 35 (1918), No. 208, pp. 359-352).—This is a discussion of some phases of the paper by Jeffreys above noted.

Rapid respiration after death, A. R. C. HAAS (Proc. Nat. Acad. Sci., 3 (1917), No. 12, pp. 688-691).—In a study of *Laminaria* by methods previously noted (E. S. R., 35, p. 821), the author shows that *Laminaria* may respire more

rapidly after death than in its normal condition. This is the case when it has been killed by alcohol, acetone, ethyl bromid, or formaldehyde, or by wounding, drying, or other means.

The influence of illuminating gas and its constituents on certain bacteria and fungi, C. A. LUDWIG (*Amer. Jour. Bot.*, 5 (1918), No. 1, pp. 1-31).—In tests with illuminating gas, methane, ethylene, and carbon monoxid on 13 bacteria and 12 fungi no marked sensitiveness was observed in case of concentrations below 25 per cent. Stronger concentrations, however, checked or stopped growth, sometimes sterilizing a culture completely. Where growth was resumed after exposure to air, it was often apparent that some cells had been killed. Different species show different degrees of tolerance. The species relatively intolerant of one gas is not to be relatively intolerant of others. Cultivation of a strain in gas appeared to weaken its vigor. The colony habit may be strikingly modified in the more toxic gases. The effect of illuminating gas can not be attributed to any one constituent. It is probably the resultant of several effects plus that of oxygen deficiency. The amount of gas often present in the laboratory is not a menace to cultures of bacteria and fungi. Ethylene and methane are both exceeded in toxic effect by carbon monoxid and illuminating gas, which are about equally toxic.

A bacteriological method useful for the study of other microorganisms, FREDA M. BACHMANN (*Amer. Jour. Bot.*, 5 (1918), No. 1, pp. 32-35, figs. 2).—This method as described is claimed to be admirably adapted not only to counting but also to morphological study of single cells, as the colonies are flat and the cell structure is not obscured by anything in a higher or lower plane.

Sterility, auto-inconceptibility, and physiological sexual differentiation, M. J. SIRKS (*Arch. Néerland. Sci. Exact. et Nat., Ser. 3 B*, 3 (1917), No. 2-3, pp. 205-234).—This is chiefly an analytical and critical discussion of the findings and views of various investigators, with some views of the author on the nature and causes of sterility and inconceptibility as these terms are here defined and employed.

A criticism of the evidence for the mutation theory of de Vries from the behavior of species of *Oenothera* in crosses and in selfed lines, B. M. DAVIS (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 12, pp. 704-710).—This is mainly a discussion of work and results reported by various authors on the forms which have arisen by breeding from *O. lamarckiana* and its descendants and the behavior of such forms.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1915 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 44* (1918), pp. 71, pls. 11).—This inventory covers the period between July 1 and September 30, 1915, and describes 419 introductions, most of which were secured from correspondents in various parts of the world. A notable collection from Peru, made by O. F. Cook, of this Department, is included.

FIELD CROPS.

[Report of field crops work in British East Africa, 1915-16], H. H. HOLDER, J. JOHNSON, and C. J. MONSON (*Dept. Agr. Brit. East Africa Ann. Rpt. 1915-16*, pp. 19-23, 35-42, 48-51).—Field tests on the experimental farms at Kibos and Kabete with beans, cotton, peanuts, corn, rice, sugar cane, flax, wheat, potatoes, barley, tobacco, and miscellaneous forage crops are briefly reported. In continuation of work previously noted (*E. S. R.*, 37, p. 734).

[Hawaiian grasses], A. S. HITCHCOCK (*Sci. Mo.*, 5 (1917), No. 4, pp. 323-349; 5, pp. 419-432, figs. 44; *abs. in Nature* [London], 100 (1917), No. 2499, pp. 57.

53).—A botanical trip to the Hawaiian Islands is described, in which mention is made of the more important indigenous and introduced grasses of the islands.

[Culture tests of improved grasses]. H. WITTE (*Sveriges Lantbruk. Tidskr.*, 26 (1916), No. 5, pp. 185-194, fig. 1).—These tests were conducted at Svalöf and Luleå with a variety of timothy and one of meadow fescue bred at Luleå, located nearly 700 miles north of Svalöf.

The timothy grown at Svalöf produced a yield 12 per cent below that secured from Swedish commercial seed and 20 and 26 per cent below the yields of Primus and Gloria timothy, respectively. The variety also produced a very small second growth and was largely subject to rust (*Puccinia phlebotensis*). At Luleå this variety of timothy on the basis of 6 crops gave a yield 20 per cent higher than ordinary commercial timothy and also produced a greater yield than was obtained from Primus.

The variety of meadow fescue at Svalöf gave poorer yields than those secured from the variety of timothy. The average yield of 6 crops was only 60 per cent of the yield secured from Danish commercial seed. The meadow fescue also showed only a small second growth and a heavy infection of rust, (*P. coronata*).

Experiments on the influence of the time of cutting on the yield and quality of the hay, K. IVERSEN and H. K. KRISTENSEN (*Tidsskr. Plantergl.*, 24 (1917), No. 3, pp. 405-435).—Experiments conducted in eight localities in 1912 and in four localities in 1913 are described and the results reported. Cuttings were made June 7, when orchard grass had headed; June 17, when orchard grass was in bloom and timothy had headed; and June 27, when the grasses had completed the blossoming period.

The average yield of hay from the latest cuttings was larger by about 1 cwt. per tündeland (1.36 acres) than that from the earliest cutting. While early cutting increased the returns from the later cuttings, the increase was not enough to offset the loss sustained in cutting early. The midseason and late cuttings, with the second cutting taken into account, gave about equal results.

The early cuttings were characterized by a proportionately large quantity of orchard grass, while in the late cuttings timothy was the more prominent. The yield of hay increased as the plants progressed in maturity, and during this period the chemical composition changed, the digestibility of the hay was reduced, and the feeding value diminished to a considerable extent. The results of analyses are given in tables.

[Pasture experiments in 1916], N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 5, pp. 413-438, figs. 3; *Meddel. Centralanst. Försöksg. Jordbruksområdet*, No. 151 (1917), pp. 28, figs. 3).—The results of several local pasture experiments here reported indicate that in middle Sweden pastures properly managed and under favorable soil and climatic conditions are capable of producing over 3,000 feed units per hectare, the feed unit representing the feeding value of 2.2 lbs. of mixed concentrates. On some of the best of these lands pastured with milk cows 4,147 kg. of milk per hectare (3,690 lbs. per acre) were obtained.

The use of barnyard manure and sulphate of ammonia or nitrate of soda produced a marked increase in the pasture over the application of only phosphoric acid and potash.

A series of plats was clipped every four weeks to correspond to the time the different paddocks were grazed. It was found that the best aftergrowth was secured in June, July, and August. Later than this period the aftergrowth declined rapidly. The treatment of these plats favored the development of the taller-growing grasses at the expense of those of low growth

and of clover. This effect of repeated clipping was not noticeable the following year. In 1916 clover represented about 20 per cent of the pasture plants and the chemical composition of the herbage was about the same as in the preceding year.

The results of digestion experiments indicated that an average of 78 per cent of the organic matter was utilized by the animals.

[Varieties of wheat and oats], H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 26 (1916), Nos. 3, pp. 97-108; 6, pp. 219-231, pls. 2).—The description of several new varieties of wheat and one of oats is presented in a series of articles, and the results of comparative tests in which these varieties were included are reported. The varieties of wheat specially considered are Fylgia, Pansar, Svalöf Extra-Squarehead III, Svalöf Sol Wheat II, and Thule II, and of oats, Svalöf Klock III.

The results of experiments at Svalöf showed that Fylgia and Pansar wheat ranked above other varieties in the test in average yield, and also indicated their higher winter resistance. Pansar also gave good results in general field culture in southern Sweden and was characterized by high rust resistance. Extra-Squarehead III grown in a comparative test at Svalöf from 1912 to 1915, inclusive, gave an average yield 2.5 per cent greater than that secured from Extra-Squarehead II, and was also higher in weight per bushel than that variety. Sol Wheat II compared at Svalöf and in a series of local tests with Sol Wheat I and Extra-Squarehead II gave a higher yield than these varieties. Sol Wheat II as compared with Sol Wheat I had a shorter vegetative period, a stiffer straw, and a somewhat higher yielding capacity.

Tests of new winter wheats obtained through hybridization and selection brought out the value of the yielding capacity and winter resistance of Pansar II as compared with other lines of Pansar wheat for southern Sweden and of Thule II as with Thule I for middle Sweden. Thule II is regarded as one of the best varieties with reference to earliness, strength of straw, yielding power, and grain quality thus far obtained.

Svalöf Klock Oats III is described as a new, high-yielding, early variety adapted to the regions of middle Sweden where black oats are grown. The pedigree of the variety is presented and the results of plot and local field tests are reported. It was found that Klock Oats III gave greater yields than Klock Oats II, but that in time of maturity and strength of straw the two varieties were equal. It is believed that Klock Oats III may be substituted with profit for Klock Oats II, but that it should not be grown instead of Great Mogul where this variety, although of late maturity, gives good results. Great Mogul under favorable conditions somewhat outyielded Klock Oats III, besides producing a larger quantity of straw.

Culture tests with root crop strains, 1914-1916, L. HELWEG (*Tidsskr. Planterari*, 24 (1917), No. 1, pp. 1-67).—Culture tests were conducted in five localities with strains of Barres field beet and in seven localities with strains of swedes.

Among the strains of Barres field beet Strynø, Tystofte, Pajbjerg, and Ferritslev, mentioned in the decreasing order of production, ranked highest in average yield of dry matter, the range being from 8,430 to 8,130 kg. per hectare (7,503 to 7,236 lbs. per acre). Strynø also gave the highest yield of beets, 72,500 kg. per hectare (32.26 tons per acre). This strain further ranked high in quality, standing second with 1.8 per cent of branched beets and first with only 1.1 per cent of prematurely seed-producing plants. In conjunction with one other strain it proved to be the most uniform and the easiest to harvest.

The best yielder among the swedes was an Olsgaard strain, which produced an average of 8,380 kg. of dry matter and 71,300 kg. of roots per hectare. In

shape of crown, ease of harvesting, and uniformity this strain also ranked high. The strains designated as Studegaard and Klank showed the greatest disease resistance.

Alfalfa breeding experiments, P. N. KONSTANTINOV (*Selsk. khoz. i L'zvor.*, 332 (1916), Sept.-Oct., pp. 32-74; Nov.-Dec., pp. 75-124).—This reports rather extensive studies by biometric methods of local strain and of Grimm, Tounsk, French, Turkestan, and German alfalfas, accompanied by considerable tabulated data. The evidence is held to indicate that pure, light coloring, and one tone dark coloring of alfalfa seeds characterize pure strains, while a greenish or greenish-chocolate color is indicative of hybrid strains.

Some effects of successive cropping to barley, W. F. GRUNKE (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 325-332).—This paper, a contribution from the University of California, discusses some of the effects of continuous cropping to barley on a fertile soil under greenhouse conditions, the successive crops being grown concurrently, in order to eliminate, as far as possible, such environmental factors as climate and season. Tabulated data are presented showing the length of the period of harvest, tillering, height of stalk, weight of grain for the individual heads, and average weight of kernel per head. Certain relationships have been emphasized and discussed as follows: Those showing the different kinds of stalk production and maturation of the crops, those showing the total and average height of the different kinds of stalks of the crops and those showing the quantity and quality of grain produced as related to the height of stalk in each crop. Pots producing from one to four crops were represented in the series.

In summarizing his observations the author states that "plants of the fourth crop matured with greater uniformity than those of any of the other crops. There were no barren stalks in the plants of the fourth crop. The number of tillers and barren stalks increased with the plants grown in the soil of a lesser number of crops. The total height of all the stalks produced decreased with each successive crop, but the average height of the individual stalks increased with each successive crop. In the fourth and the third crops the heaviest grain, both as to weight per head and as to average weight per kernel, varied with the height of the stalks. The tallest stalks produced the largest heads and the largest average weight per kernel. In the second and first crops no correlation between the height of stalks and weight of grain per head or average weight per kernel was obtained."

Bean growing in Arkansas, W. H. WICKS and C. H. HEARD (*Arkansas Sta. Circ.* 41 (1918), pp. 4).—A brief popular description of methods employed in growing the crop, with notes on diseases and insect pests.

Notes on Canavalia with the descriptions of new species, C. V. PIERCE (*Proc. Biol. Soc. Wash.*, 30 (1917), pp. 175-178).—Various species and varieties of *Canavalia* under test at different places in the Southern States to determine their possible agronomic value are said to include two heretofore undescribed species, *C. campylocarpa* and *C. luzonica*. Certain modifications are noted by regard to the nomenclature of *C. microcarpa* (*C. turgida* and *Lathyrus microcarpus*) and *C. obtusifolia* (*Dolichos obtusifolius* and *C. lineata*).

Correlations between ear characters and yield in corn, H. H. LOVE and J. B. WENZ (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 315-322).—This paper, a contribution from Cornell University, presents experimental data on the correlation of seed-ear characters and yield when the seed ears were not selected for extremes in the particular characters studied but were near the average ear type, and is a continuation of earlier work.¹ The characters studied included

¹ Ann. Rpt. Amer. Breeders' Assoc., 7 (1912), pp. 29-40.

length, average circumference, average cob circumference, and weight of ear, number of rows; average weight, average length, and average width of kernels; and percentage of grain. The corn used was Cornell No. 12, a selection from Funk Ninety Day. Tabulated data show the correlations obtained for all the characters for each year of the 5-year period 1910-1914, inclusive, together with the correlations obtained with the same lot of corn in 1909 and 1910.

The average mean percentage of grain in seed ears of a few of the highest classes for the 5 years amounted to 87.596, with a yield of 0.692 lb. per stalk. The average mean percentage in the lowest classes was 81.053 of grain, with a yield of 0.753 lb. per stalk.

It has been concluded that "the characters of length, ratio of tip circumference to butt circumference, average circumference of cob, weight, average weight of kernels, number of rows of kernels, and average length and width of kernels on the seed ears do not show correlations significant enough to be of value in judging seed corn. The data indicate a slight negative correlation between percentage of grain in the seed ear and yield, meaning that possibly ears containing a low percentage of grain yield higher than ears with a high percentage of grain. The average circumference of the seed ear is the only character that shows any significant relation to yield.

"The judge at a corn show or a farmer in selecting his seed corn can not pick the high-yielding seed ears when judging from outward characters of the ears. It is evident that the points emphasized on a score card are of no value for seed-ear purposes and are entirely for show purposes. The only basis left for selecting high-yielding seed corn is the ear-to-row progeny test."

The relation of the vigor of the corn plant to yield. A. E. GRANTHAM (*For Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 340-343).—This paper, a contribution from the Delaware Experiment Station, briefly notes field observations made by the author on the effect upon yield of variations in the size and vigor of corn plants under average field conditions. The corn under observation was planted in hills 42 in. apart each way, with 2 plants to the hill. Of the first 50 hills selected in which there was a marked difference in the size and vigor of the 2 plants the weaker stalk was removed, while in another 50 hills the strong stalk was removed. The heights of the remaining stalks were noted at the time of thinning, and further measurements were made at approximately 8 day intervals from June 25 to September 13 to determine the rate of growth. The date of tasseling was observed, and the weight of ears and yield of dried shelled grain noted.

The maximum difference in the height of the weak and vigorous stalks was obtained on August 5, when the latter came into tassel and amounted to 23.3 in. The average date of tasseling of the weaker plants was August 12. Although the difference in height on June 25 amounted to 95 per cent, on September 15 it was only 9 per cent.

The weight of the ears from the strong plants varied from 277 to 338 gm. and from the weak plants from 60 to 283 gm., the average weight of ears amounting to 309 and 177 gm., respectively. The yield of dried shelled grain was 221.7 gm. for the strong plants and 109.6 gm. for the weak plants, the weight of cob amounting to 41.7 and 88.8 gm., respectively.

The results of these observations are held to indicate that the weaker plants in a population of corn are much below the average in yield, and that, although the stand of plants may be perfect, only an ordinary yield will be obtained. While weak plants may sometimes be the result of environment, it is thought that weakness may also be inherited as a result of a lack of vigor on the part of the kernel. The planting of several kernels to the hill to furnish a wider

opportunity for the selection of strong plants is suggested as a possible means of obtaining a considerable advance in yield through a rigid selection of only the more vigorous plants.

Selection and storage of seed corn, W. L. BURKISON and E. A. WHITE (*Illinois Sta. Circ. 225 (1918), pp. 16, figs. 14*).—In view of the seed corn shortage of 1918, suggestions are made relative to the early selection of seed from the field and to the proper handling of seed corn in order to escape injury from freezing temperatures. Various methods of storing the seed are briefly discussed, and descriptions are given of houses specially designed for the storage of relatively large amounts of seed.

Varieties of cotton, 1917, W. E. AYRES (*Arkansas Sta. Bul. 145 (1918), pp. 33, figs. 2*).—This reports the results of extensive variety tests conducted about the same general lines as those previously noted (E. S. R., 37, p. 612). The experimental work included tests with 71 varieties and strains of cotton grown at Fayetteville and Scotts and cooperatively at Van Buren and Wynne, a test for early maturity with 10 varieties grown at Fayetteville, cooperative tests with 31 common varieties at Russellville and Monticello, and cooperative tests conducted at several points in the State with 15 nonresident and 12 wilt-resistant varieties. The season of 1917 was regarded as a very poor one for cotton. All data are presented in tabular form.

The leading varieties in point of yield of lint in the principal tests were as follows: At Scotts, Cook No. 912 with 475.3 lbs. per acre; at Van Buren, Boykin with 565.6 lbs.; and at Wynne, Dodd Profile with 232.2 lbs. Descriptive data are submitted for the varieties grown at Fayetteville. In the tests for early maturity Express was first with 231.5 lbs. per acre.

Varieties of cotton. Summary report 1917, W. E. AYRES (*Arkansas Sta. Circ. 39 (1918), pp. 8*).—A summarized report of the variety tests noted above.

Manurial experiments with Sea Island cotton in St. Vincent, with some notes on factors affecting the yield, S. C. HARLAND (*West Indian Bul. 16 (1917), No. 3, pp. 169-202, pls. 10, figs. 3*).—This reports the results of fertilizer experiments with cotton for the period of 1912-1917, and a study of certain other factors affecting yield for the season of 1916-17, namely, the number of flowers opening daily on each plat of the fertilizer series from September 8 to February 14; the number of bolls opening daily on each plat for a period of 53 days followed by pickings at 5-day intervals; a daily examination of about 30 plants to obtain an accurate record of the fate of each bud, flower, and boll produced; and a correlation of daily meteorological observations with crop yield. Considerable tabulated data are presented, together with several charts and plant diagrams illustrating the results obtained.

The results of the fertilizer tests are held to indicate that differences in fertilizer treatment do not cause appreciable differences in the percentages of flowers producing ripe bolls. The highest average yield of seed cotton was obtained from plats receiving potassium sulphate alone and amounted to 653.4 lbs. per acre, as compared with a yield of 524.4 lbs. from the untreated checks. The next highest yield, 648.6 lbs., was obtained from a mixture of phosphorus, potassium, and cottonseed meal.

In summarizing all results the author concluded that the principal loss in crop yield in St. Vincent was occasioned by shedding, due to heavy rainfall and complicated by fungus and bacterial diseases. June- and July-planted cotton suffered a loss of practically 50 per cent of the crop through bud-shedding, the remaining 50 per cent being subjected to disease attacks rendered especially virulent by the usual heavy rains. Late planted cotton showed little bud-shedding, but considerable loss through internal boll disease. Late plantings (August or September) are deemed an adequate remedy for losses through

bud-shedding, due to heavy rainfall, but could only be recommended where effective legislation was obtained against the food plants of the cotton stainer, *Nysdercus delauncyi*, which is thought to spread the internal boll disease. Furthermore, it is maintained that the cotton varieties have not suffered any inherent deterioration, but that environmental factors are responsible for decreased yields.

[English rye grass], H. WITTE (*Sveriges Utsädesför. Tidskr.*, 26 (1916), No. 5, pp. 195-208, figs. 2).—A brief history of the culture and distribution of English rye grass, *Lolium perenne*, is given, and a comparison of its cultural value with other grasses is reported. Breeding work with the grass at Svalöf is described and a new, improved strain known as Svalöf Victoria rye grass is noted.

At Svalöf, English rye grass gave a yield higher than that obtained from timothy but lower than the yields secured from orchard grass, meadow fescue, French rye grass (*Avena elatior*), and brome grass (*Bromus arvensis*). The second year's crop was smaller than that of each of the grasses mentioned, with the exception of French rye grass, as this is an annual. Varieties of English rye grass known as evergreen, annual, dwarf perennial, and Sutton perennial gave results at Svalöf practically the same as those obtained from the ordinary Swedish commercial variety, but a Norwegian sort proved to be from 10 to 12 days later in maturity, of low growth, and little resistant to rust (*Puccinia coronata lolii*). This variety was found to succeed much better in moist and cool than in dry seasons.

The breeding work at Svalöf showed variations in length, position and quantity of stems, tillering capacity, size of leaves, period of growth, winter resistance, rust resistance, and other characters. It is pointed out that for mixing with early-blooming red clover for conditions prevailing in southern Sweden a rye-grass variety is required which gives high yields from the different cuttings, has the same flowering period as that of the clover, shows high resistance to winter weather and rust attacks, and produces good yields of seed. Svalöf Victoria rye grass is regarded as filling these demands to some extent, as it yields better and matures from 10 to 12 days later than the ordinary English commercial variety, proves winter and rust resistant in southern Sweden, produces a comparatively heavy forage, shows good strength of stem, and is dark green in color.

Hedychium coronarium in Brazil, C. BEADLE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 3 (1917), pp. 104, 105; *abs. in Nature* [London], 100 (1917), No. 2504, p. 152).—On a trip through South America to determine the extent to which *Hedychium* has become established and to study the possibilities of its use for paper making, the author found the plant in small patches in the State of Rio, Brazil, but particularly abundant on the low-lying lands in the State of Parana. The habits of growth of the plant are noted, and the conclusion reached "that a far whiter fiber may be extracted than has hitherto been employed by taking fairly simple precautions."

Wisconsin's hemp industry, A. H. WRIGHT (*Wisconsin Sta. Bul.* 293 (1913), pp. 46, figs. 21).—This bulletin gives an account of the establishment of the hemp industry in the State, 7,000 acres being grown in 1917, and outlines the possibilities for its future development. Field methods employed in growing and harvesting the crop are described, with particular reference to the use of improved harvesting machinery. Yields of fiber are said to average 1,200 lbs. per acre, and the gross returns \$75 per acre.

New Zealand hemp industry, W. H. FERRIS (*Ann. Rpt. Dept. Agr., Indus. and Com., New Zeal.*, 1917, pp. 22, 23).—This briefly reports on the progress of the

industry for the year ended March 31, 1917. The graded output amounted to 140,898 bales, exceeding that of the previous year by 11,623 bales. Tabulated data are presented giving particulars of the gradings during the year.

Report on experiments with early varieties of oats. S. RIBOUX (*K. Lundsber. Akad. Handl. och Tidskr.*, 56 (1917), No. 2, pp. 150-169; *Möbbl. Centralanst. Försökr. Jordbruksområdet*, No. 142 (1917), pp. 15). The results of tests with four varieties of oats conducted for three years beginning with 1913 in two widely separated localities, including one in northern Sweden, are reported. The varieties under test were Orion, Björn (sorts improved at Svalöf), Mesdag, and Nordfinsk. In the southern localities the experiments were conducted on a moist and cool alluvial clay soil and in the northern on a bog soil (a mixture of sand and peaty substances), and the dates of seeding ranged from April 20 to May 6 and from June 4 to 9, respectively.

Even under such widely different climatic and soil conditions Orion gave the highest average yield of both grain and straw. The percentage of hulls in Orion was generally higher than in the other varieties, but in the yield of hulled kernels this variety retained first place. It is believed that under the widely different conditions of the localities the experiments have not been conducted sufficiently long to warrant very definite conclusions.

The effect of different rotation systems and of fertilizers on the protein content of oats. R. W. THATCHER and A. C. ARNY (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 344-348).—This paper, a contribution from the Minnesota Experiment Station, reports observations of the effect upon the protein content of oats of different rotation systems with and without clover and of different fertilizer treatments used in a 3-year rotation of oats, clover, and corn. The protein content was determined for oats grown in rotation from 1914 to 1916, inclusive, and for oats grown with different fertilizers from 1915 to 1916, inclusive. The following summarized table shows the percentage of protein found with the various treatments:

Effect of different rotation systems and fertilizer treatments upon the protein content of oats.

Effect of rotation.			Effect of fertilizer.	
Rotation.	Manure applied.	Average protein content of dry matter, 1914-1916.	Fertilizer used.	Average protein content of dry matter, 1915-1916.
<i>Per cent.</i>				
None, continuous oats....	6 tons per acre each third year.	12.64	None (check plot).....	12.79
2-year, oats and wheat....	6 tons per acre each third year.	12.51	Commercial only.....	15.21
3-year, oats and corn.....	6 tons per acre each third year.	12.75	Manure + commercial.....	15.06
2-year, oats, clover, corn....	None.....	14.71	Manure + nitrate of soda....	15.75
3-year, oats, clover, corn....	6 tons per acre, preceding corn.	14.33	Manure + nitrate of soda....	15.49
4-year, wheat, clover, corn, oats.	5 tons per acre, preceding corn.	15.29	Manure + raw rock phosphate.	14.16
5-year, wheat, clover, pasture, corn, oats.	10 tons per acre, preceding corn.	15.14	Manure + acid phosphate....	14.34

Winter storage experiments with potatoes, 1913-1917. L. HELWEG and F. K. RAYN (*Tidskr. Planteavl*, 24 (1917), No. 3, pp. 436-463, figs. 41).—This article reports the results of experiments in storing potatoes in pits and compares them

with earlier results secured in similar work with swedes and field beets. The method of preparing the pits is described and illustrated.

It was found that in pits properly constructed potatoes stored dry as compared with swedes and field beets sustained about the same loss in dry matter during winter storage. As the loss of dry matter during the first part of the storage period was largest in the swedes and smallest in the potatoes, it is recommended that when potatoes are to be used for feeding purposes the swedes be used first, then the field beets, and the potatoes last.

Experiments on the ventilation of the pits did not give conclusive results, but indicated the advisability of ventilation in order to avoid rotting when the tubers must be stored during wet weather. Screening the potatoes for the removal of dirt from the tubers apparently had no influence upon the loss of weight and of dry matter. The greatest loss from the rotting of tubers was due to frost injury and the prevalence of moisture in the pits. It is believed that by means of careful spraying through the period of growth the loss from decay due to disease infection of the stored tubers was reduced to less than 0.5 per cent. The methods employed in ventilating the pits and in placing the thermometers allowed a greater loss than should occur under average conditions in general practice.

The soy bean: Its culture and uses, W. J. MOUSE (*U. S. Dept. Agr., Farmers Bul.* 973 (1918), pp. 32, figs. 14).—This is a rather detailed account of the climatic adaptations, methods of production, and uses of soy beans, with brief descriptions of the more important commercial varieties and of recently improved sorts.

Experiments with different varieties of sugar beets, H. A. B. VESTERGAARD (*Tidskr. Planteavl.* 24 (1917), No. 3, pp. 321-356, figs. 2).—The tests reported were conducted at Abeld from 1908 to 1913, and at Tystofte from 1913 to 1915. The following varieties and strains were under test at both places from 1913 to 1915: Original Klein Wanzleben Early, Original Klein Wanzleben Late, Strandes, Mette Klein Wanzleben Elite, Russian, and three strains of Koda Wanzleben supplied by the Danish beet sugar factories.

A summary of the data obtained during this period shows the following ranges in average results: Yield of beets, 31,800 to 36,000 kg. per hectare (14.15 to 16.02 tons per acre); sugar content, 18.6 to 19.4 per cent; yield of sugar, 6,140 to 6,750 kg. per hectare; and yield of beet tops, 20,100 to 22,100 kg. per hectare. The number of beets going to seed the first year ranged from 13 to 36 per cent. The results at Abeld indicated a purity coefficient ranging from 89 to 91 per cent. At Tystofte the number of branched or forked beets ranged from 17 to 23 per cent.

Mette Klein Wanzleben Elite and Russian gave the lowest yields of beets and of sugar but ranked high in sugar content. These two varieties also showed the highest percentages of beets going to seed prematurely. The highest yields of beets and of sugar were secured from the two original Klein Wanzleben varieties, but the three strains from the Danish sugar factories representing commercial seed gave nearly as good returns.

Farm practice in growing sugar beets for three districts in Utah and Idaho, 1914 and 1915, L. A. MOORHOUSE, T. H. SUMMEES, R. S. WASHBURN, and J. W. JONES (*U. S. Dept. Agr. Bul.* 693 (1918), pp. 44, figs. 10).—This bulletin presents data obtained in a detailed study of field operations and their related costs in 1914 and 1915 in the production of sugar beets upon 173 farms in three representative areas situated near Provo and Garland, Utah, and Idaho Falls, Idaho. The total costs are based upon the production of 1,461 acres of sugar beets in

the Garland area, 833 acres in the Provo district, and 735 acres in the vicinity of Idaho Falls. The average yields varied from a little more than 13 tons per acre for the Idaho Falls area to about 15 tons for the Provo and Garland districts. Data as to the various cultural operations are summarized in tabular form and fully discussed. The results obtained may be briefly noted as follows:

The most important differences in the field practice employed were found in such operations as manuring, plowing, disking, harrowing with the spring-tooth harrow, cultivating (some using a 1-man-1-horse crew and others a 1-man-2-horse crew), and performing the hand labor (some utilizing the available farm help, while others had this done on a contract basis).

There was a direct relation between the distance the beets were hauled and the cost per ton for marketing.

Labor costs constituted from 54.4 to 58.3 per cent of the total expense of production. This included all man and horse labor as well as the contract labor. The next largest item was interest on investment in land, approximating 23.3 per cent of the total costs in the Garland area, 25.5 per cent at Provo, and 21.1 per cent at Idaho Falls. The total cost of production was \$62.03 per acre, or \$4.65 per ton, for the Garland district; \$63.50 per acre, or \$4.65 per ton, for Provo; and \$62.68 per acre, or \$4.60 per ton, for Idaho Falls. The total credits per acre were \$74.40 at Garland, \$74.20 at Provo, and \$62.16 at Idaho Falls, the estimated value of the beet tops being included in these credits.

In the Garland and Provo areas sugar-beet production proved to be the most important enterprise of the farms under observation, over 40 per cent of the total farm receipts being secured from the sale of sugar beets. At Idaho Falls sugar beets and potatoes were found to be of about equal importance.

The yield per acre is deemed to be an essential factor in reducing the cost per ton and consequently in increasing profits, and any change in the system of farm management that will contribute to increased yield without materially increasing the cost of production should receive the consideration of the grower. A study of the returns on these farms is said to emphasize the fact that a large number of operators did not have a margin of profit after allowance had been made for all expenses connected with the production of the crop, including interest on investment.

A study of the root system of the sugar cane and its application to the production of ratoon crops. C. W. HINES (*Philippine Agr. Rev. [English Ed.]*, 19 (1917), No. 2, pp. 151-161, figs. 7).—This is a general discussion of the vegetative propagation of sugar cane and the development of the root system of cuttings of sugar cane, based on observations begun eight years ago on plantations in Porto Rico, Louisiana, and Mexico and continued at the experiment stations of the Philippine bureau of agriculture and on various plantations throughout the Archipelago and including over 400 varieties of sugar cane. All stages of growth were observed from newly-planted cane to the twelfth ratoon.

Varieties of sugar cane in 1916. W. E. CROSS (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 8, pp. 311-325).—This reports a continuation of variety tests with sugar cane, previously noted (E. S. R., 37, p. 139), giving results for 1916 and outlining field work for 1916-17.

Sugar cane varieties tested at the Tucuman experiment station. W. E. CROSS (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 11-12, pp. 451-469).—A list of the varieties and strains of sugar cane tested in Tucuman, embodying 131 distinct types and numerous less well-defined strains, with brief notes on the origin and principal characteristics of each.

The identification of varieties of Java and other sugar canes, G. L. FAWCETT (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 10, pp. 424-431, figs. 7).—Summarizing work already noted (E. S. R., 37, p. 139), the author presents a scheme of identification for several varieties of sugar cane based on simpler and more conspicuous characteristics than that first proposed.

An annual variety of *Melilotus alba*, H. S. COE (*Jour. Amer. Soc. Agron.*, 8 (1917), No. 8, pp. 380-382).—Seed of *M. alba* obtained in Alabama and planted at Redfield, S. Dak., and Fargo, N. Dak., in 1916, produced plants at both stations approximating 5 per cent of the whole, which flowered abundantly and matured seed in 1916. A careful examination of the plants showed that their botanical characters were practically indistinguishable from those of a second year's growth of *M. alba*. However, the plants which bloomed the first year in every case produced a typical annual taproot with no enlargements at the crowns and with no crown buds. None of these plants survived the winter of 1916-17, whereas only a small percentage of the normal *M. alba* plants winter-killed. Plants grown in the greenhouse from seed from a number of the annual plants produced typical annual taproots comparing favorably with those of the parent plants grown under field conditions.

The plant is described as a new variety and specimens have been placed in the herbarium of the New York Botanic Garden, the National Herbarium, and the Asa Gray Herbarium.

Storage rots of sweet potatoes, J. A. ELLIOTT (*Arkansas Sta. Bul.*, 144 (1918), pp. 3-16, figs. 16).—Brief notes are presented on sweet potato losses due to storage rots and means for preventing the losses through the proper handling of the potatoes and the construction of storage houses and bins described, including plans and specifications.

New spring wheat varieties, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 27 (1917) No. 2, pp. 51-76, pls. 2).—Comparisons of a number of varieties of spring wheat, including several new sorts, were conducted for a series of years at Svalöf and Uluna, together with a number of local tests, and the results attained are herewith reported. The new varieties are described, the breeding work with spring wheat at Svalöf is reviewed, and the possibilities of spring-wheat improvement are briefly pointed out.

Svalöf Extra-Club is described as a new hybrid variety adapted to southern Sweden and having the same ripening period as Club, but a higher yielding power. Svalöf Spring-Squarehead is noted as a new hybrid sort suited for fertile soils in southern Sweden and as being more productive than Spring Pearl, one of its parents. In the tests at Svalöf the average yields for several years show that the yield of Svalöf Extra-Club was about 15 per cent and that of Svalöf Spring-Squarehead nearly 10 per cent higher than the yield of Svalöf Club taken as a standard. In straw production these varieties also ranked above Svalöf Club, but not to so great an extent. At Uluna also Svalöf Extra-Club outranked Svalöf Club and five other varieties in yield.

Hybrid No. 0880, derived from Dala and Club, was tested with reference to its value for middle Sweden. The results showed that the new variety combined the desirable characters of its parents with a greater yielding capacity in 9 tests conducted from 1912 to 1916 in southern and middle Sweden. The average yield of this hybrid was 2,430 kg. per hectare (39.14 bu. per acre), or 9 per cent greater than that of Club, and in 7 tests, including both parents, the average yield was 2,370 kg. per hectare, or 9 per cent above the yield of Dala and about 6 per cent above the yield of Club.

[Winter resistance of wheat varieties], Å. ÅKERMAN and H. JOHANSSON (*Sveriges Utsädesför. Tidskr.*, 27 (1917), No. 2, pp. 77-83; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, pp. 127.

1236).—Plants of different varieties of wheat of known winter resistance were studied to determine a possible relation between chemical composition and the character of resisting low temperatures. Sample plants were taken January 26, 1917, and one and two weeks later. The chemical methods employed are described.

The results indicated a definite relation between winter resistance and the content of reducing substances consisting principally of sugar and being water soluble and not precipitable with mercuric nitrate. The content of these substances decreased consistently with the winter resistance of the varieties studied.

Linked quantitative characters in wheat crosses. G. F. FARMAN (*Gen. Nat.*, 51 (1917), No. 671, pp. 683-689).—This reports a study of macaroni and bread wheat crosses in an effort to discover whether or not there is a linkage between the shape of head; that is, the ratio of width of head (measured parallel to the face of the head which shows the sinuous furrow formed between the two rows of spikelets), to thickness of head (measured parallel to the array of seeds in the spikelet), and texture (translucency or opaqueness) of grain. Of the two parents the macaroni wheat had a much flattened head and very hard, translucent grains, whereas the bread wheat had a nearly square head with soft, opaque grain.

The parent strains and the F_2 progeny were grown in 1914 and resulted in the ratio W/T of the F_2 plants being much nearer to the macaroni parent both in average and distribution than to the bread wheat parent. Similar observations of the parent strains and the F_2 progeny in 1915, and of the F_2 progeny in 1916, however, showed a uniform correlation between texture of grain and the ratio W/T. Tabulated data show the frequencies and distribution.

The author states that "the question now arises as to whether this correlation is genetic or physiological," and adds "might it not be caused by the simple fact that poorly filled (with starch), hard grains will give rise to a more flattened head than will plump (starchy, soft) grains by failing to fill up and distend the glumes?" The answer to this question is sought in a further analysis of the data presented, and it is concluded that they seem "to indicate but the two characters, hardness of grain and high ratio of width to thickness of head, which entered this cross together in the macaroni parent, tend to come out together in the segregates of the F_2 and F_3 generations, i. e., that there is a genetic linkage between one or more of the factors controlling the grain texture and head shape in the two varieties employed as parents."

The bulk handling of grain on Washington farms. A. ROBINSON (*Wash. State Col. Ext. Dept.*, Ser. 1, No. 29 (1917), pp. 20, figs. 9).—This presents a study of the bulk system of handling wheat, made by the State College of Washington in cooperation with the Bureau of Markets of the U. S. Department of Agriculture, and is based on information gathered from 79 farmers in Washington who bulked over 550,000 bu. of grain during the season of 1916. The discussion embraces the methods of cutting the grain, storage on the farm both in portable bins and in permanent farm granaries or elevators, and handling. Specifications for the construction of portable bins, farm elevators, and bulk wagon boxes are included, together with the estimated cost of each.

Grain inspection in Illinois, 1915-16. J. P. GIBSONS (*Ann. Rpt. Ill. State Grain Insp. Dept.*, 46 (1916), pp. 288).—This contains the forty-sixth annual report of the Illinois State Grain Inspection Department, the forty-fifth annual report of the Registration Department, the provisions adopted by the State Public Utilities Commission of Illinois regarding warehousing and inspection of grain, and the rules governing the inspection of grain in the State.

A total of 490,020,048 bu. of grain was inspected during the year.

[Grain inspection in Minnesota] (*Ann. Rpt. Chief Insp. Grain, Minn., 1916*, pp. 63, fig. 1).—This includes the thirty-first annual reports of the State Grain Inspection Department and the State Grain Weighing Departments at Minneapolis and Duluth, the eleventh annual report of the Hay and Straw Inspection and Weighing Department, the fifteenth annual report of the Supervising Inspector of Local Warehouses, the fourth annual report from the Grain Testing Laboratory, and the annual report from the Joint Board of Grain Appeals, all of which cover the activities of the various departments for the crop year ended August 31, 1916.

A total of 1,147,438,990 bu. of grain were handled by the grain inspection department during the year.

[Production of root crop and vegetable seeds]. H. WITTE (*K. Landtbr. Årsk. Handl. och Tidskr.*, 56 (1917), No. 2, pp. 115-149, figs. 9).—This article presents an historical and statistical review of the culture of root crop and vegetable seeds in Sweden, points out the annual domestic requirements, gives dispositions for the culture of the various crops for seed purposes, discusses the cost of production and the returns, and calls attention to the possibilities and value of this industry for the country.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, 2 (1918), No. 2, pp. 8).—This number contains reports on vegetable seed crop conditions, including statistical data obtained from the War Emergency Vegetable Seed Production Survey of July 1, incomplete reports of field seed stocks for the United States and Canada, a tabular statement showing the percentage of home-grown seeds planted in truck crops as compared with the amount of seed or plants purchased from dealers, and data on the monthly average timothy seed prices for the period 1913 to 1917, inclusive. In addition, brief notes are presented on the Bermuda onion seed crop; the timothy seed outlook in Iowa, Minnesota, Illinois, and Missouri; the redtop seed situation; seed garden peas in the Northwest; the outlook for Abruzzi rye and Fulghum oats in South Carolina, Georgia, and Alabama; data as to imports of forage plant seeds, etc. Regulations for handling seed wheat and seed rye by seedsmen and grain dealers are also outlined.

HORTICULTURE.

Report of the Horticultural Experiment Station, 1916 and 1917 (*Rpt. Hort. Expt. Sta., Vineland, Ont., 1916-17*, pp. 80, figs. 34).—This comprises a progress report on breeding, fertility, cultural, and miscellaneous experiments with fruits and vegetables conducted at the Vineland Station, Ontario, in 1916 and 1917.

Inspection, certification, and transportation of nursery stock in the United States, New York State, other States, and Canada, 1918, G. G. ARWOOD (*N. Y. Dept. Farms and Markets, Div. Agr. Circ. 172* (1918), pp. 33).—A brief synopsis of the laws and regulations of the United States, the several States, and Canada, relative to the inspection, certification, and transportation of nursery stock.

A digest of the laws and regulations governing the shipment of nursery stock from New Jersey into other States and Canada, A. S. NICOLAY (*N. J. Dept. Agr. Circ. 19* (1918), pp. 24).—This circular has been compiled primarily to acquaint New Jersey nurserymen with the laws and regulations governing the interstate shipment of nursery stock.

Sections 304 and 305 of the Agricultural Law (*N. Y. Dept. Agr. Circ. 153* (1917), pp. 7).—Provisions of the Agricultural Law of New York relating to destructive insect pests, fungus and contagious diseases of trees and plants, inspection and certification of nurseries, and inspection of all nursery stock received in the State are cited.

The spraying service in Niagara County in 1917. L. V. STAN BLAND and N. R. PIER (N. Y. *Dept. Farms and Markets, Div. Agr. Bul.* 109 (1918), pp. 117, figs. 71).—This bulletin describes the organization of a cooperative spraying service in Niagara County, N. Y., and give the results secured in control of pests and diseases among various orchard fruits in 1917.

The spraying service consists essentially in the immediate delivery to all parts of the county of information relative to any outbreak of insect pests and plant diseases which might be anticipated or controlled by prompt attention.

Cultivation of vegetables. F. PIERREZ (*Dept. Agr. Progr. Quebec Bul.* 17 (1918), pp. 52, pl. 1, figs. 117).—A popular treatise on the establishment and care of a vegetable garden, including specific cultural directions for all kinds of vegetables.

The sunflower-artichoke graft. H. COHEN and M. L. Y. THOUARD ROCHET (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 21, pp. 836-838).—An analytic study of sunflower-artichoke and artichoke-sunflower graft shows that at whatever level the graft is made, and regardless of which plant is the stock and which is the scion, there exists constantly on either side of the graft a discontinuity in the polarimetric sign of the soluble carbohydrates of the scion and stock. The scattering rotatory power is always positive in the sunflower and negative in the artichoke. The pith of the artichoke does not penetrate into the sunflower stock or at least is rapidly transformed there. The artichoke stock, fed by a sunflower scion, is able to assert its autonomy in elaborating inulin not only in the tubers but in all levels of the stem below the graft at the expense of the extraneous sugar in the whole plant which is delivered to the stock by the sunflower scion.

Tomato growing in Arkansas. J. R. COOPER (*Arkansas Sta. Circ.* 99 (1918), pp. 4).—This circular contains practical directions for growing tomatoes, including the control of insect pests and diseases.

Catalogue of fruits suitable for cultivation in the Malay Peninsula. J. N. MUSEUM (*Agr. Bul. Fed. Malay States*, 6 (1918), No. 9, pp. 385-388).—A large number of fruits believed to be suitable for cultivation in the Malay Peninsula are here listed. The scientific, English, and Malay names, where known, are given for each fruit.

Investigations on apple stocks. B. T. P. BARKER and G. T. SPENCE (*Univ. Bristol Ann. Rpt. Agr. and Hort. Research Sta.*, 1917, pp. 43-54; *Four. Bath and West and South. Counties Soc.*, 5, ser. 12 (1917-18), pp. 159-171).—In continuation of previous notes (E. S. R., 37, p. 646), a summary is given of the results secured to date from an investigation of various types of apple stocks that are to be used later in a study of the influence of stock on scion.

The large number of stocks that have been under observation for a number of years are here classified into nine distinct types with reference to the nature of their root systems and described. The standard types are to be propagated and further studied with reference to their effect on scions.

The effect of cross-pollination on size, color, shape, and quality of the apple. W. H. WICKS (*Arkansas Sta. Bul.* 143 (1918), pp. [19], pls. 9).—This paper reports the results of investigations during the three years 1915-1917 relative to the effect of cross-pollination on size, color, shape, and quality of the apple. The Ben Davis, Jonathan, Winesap, and Grimes varieties were used, inasmuch as they were found to bloom at the same time in a previous cross-pollination study (E. S. R., 37, p. 744). A résumé is given of some literature concerning the effect of environment and cultural practices upon apple characters, together with a bibliography of cited literature.

As a result of this study the author found that no influence of any variety used as a cross-pollinizer could be detected on size, color, shape, and quality of

the fruit of the female parent. It is concluded that apple growers are justified in planting varieties primarily for the benefit of cross-pollination to secure the normal development of the apple. The greatest mutual affinity was found to exist between varieties crossed as follows: Ben Davis (female) × Grimes (female) × Jonathan, Grimes (female) × Ben Davis, Ben Davis (female) × Jonathan.

A review of the work of other investigators taken in connection with observations made during the present study serves to confirm the data secured and shows that variation in apple characters is caused more by various environmental and cultural factors than by cross-pollination.

Preparation of strawberries for market, C. T. MORG and H. E. TRAX (U. S. Dept. Agr., *Farmers' Bul.* 979 (1918), pp. 27, figs. 18).—This describes efficient methods of preparing strawberries for market. The phases discussed include importance of good handling, the labor problem, picking, grading, commercial strawberry grades recommended, packing, packing sheds, shipping packages, standardization of package, branding and marking, inspection and loading sheds, and loading cars.

"Reversion" of black currants, A. H. LEE (Univ. Bristol, *Ann. Rpt. Agr. and Hort. Research Sta.*, 1917, pp. 33, 34; *Jour. Bath. and West and South Counties Soc.*, 5. ser., 12 (1917-18), pp. 134, 135).—A study of a large number of black currant shoots showing various degrees of vigor led the author to observe that strong growing black currant shoots are usually topped by a vegetative terminal bud, whereas weak growing shoots are topped by a terminal flower bud. It was observed that unless the plants were unhealthy one-year and usually two-year shoots nearly always had a vegetative terminal bud. In the third year and in the fourth year the shoot has nearly always a flower bud terminal. It is pointed out that if shoots are allowed to grow for more than three years there is a great tendency for weakened or reverted wood to form, and consequently a decline in fruit production.

The relation between the period of pruning and the growth and production of the vine, L. RAVAZ (*Prog. Agr. et Vit.* (Ed. l'Est-Centre), 39 (1918), No. 41, pp. 337-339).—The author here presents and discusses tabular data secured annually for the period 1905 to 1918, inclusive, showing the effect on yield of pruning grape vines at different times of the year.

The results of the data as a whole show that the time of starting growth, the flowering season, and the maturity season are directly related to the time of pruning. In the cold regions where late spring frosts cause no damage, pruning should be delayed until after the leaves fall in order to assure maturity. Pruning about the time of bud swelling, or after the shoots have grown for an inch or two, tends to retard the growth of the vine, thus protecting it from late spring frosts. At the same time it also retards maturity of the vine. Pruning after the vintage, when the leaves are still green, likewise retards growth in the spring. The greener the shoots are when pruned in the fall the greater will be the period of retardation. Pruning at this time of the year, however, tends to weaken the vines. Strong growing vines may be pruned occasionally early in the fall when the prunings are needed for forage without causing the death of the vines.

The coconut, its culture and uses, P. J. WESTER (*Philippine Agr. Rev.* [English Ed.], 11 (1918), No. 1, pp. 1-57, 61, pls. 19, figs. 6).—An account of the coconut with reference to its botany, origin, geographical distribution, varieties, and culture, manufacture of copra, miscellaneous coconut products, and coconut pests and their control. The introduction contains a statistical review of the development of the coconut industry in the Philippine Islands.

Results of tea experiments, experiment station, Peradeniya, 1914-1917. M. K. BAMBER (*Dept. Agr. Ceylon Bul.* 37 (1918), pp. 13). A progress report on manurial and pruning experiments with tea at the Peradeniya station (E. S. R., 31, p. 837), including considerable tabular data giving details of yields from the various plots during the period 1914-1917. Until 1917 manurial experiments consisted of a cattle manure and green manures. In 1917 a number of commercial fertilizer plots were added to the experiment.

Pecan industry, F. PARK (*Cong. Rec.*, 54 (1917), pt. 6, pp. 196-198). This comprises the remarks of the author in the House of Representatives, January 6, 1917, in which are presented estimates by the Secretary of Agriculture relative to necessary additions to the appropriations to enable the Department to extend its pecan investigations, together with a memorandum on the pecan industry prepared by C. A. Reed. This memorandum deals with the importance of the pecan, the progress of the industry, and special problems in culture now confronting the pecan growers.

FORESTRY.

Our trees.—How to know them, A. I. EMERSON and C. M. WELD (*Philadelphia and London: J. B. Lippincott Co.*, 1918, 5, ed., pp. XXI+10-295, pl. 1, figs. 178).

A popular guide to the recognition of North American trees at any season of the year, including notes on their characteristics, distribution, and culture. The guide is fully illustrated with photographs from nature.

Tested forest trees for planting in Idaho, F. G. MILLER (*Idaho Sta. Circ.* 5 (1918), pp. 4).—This circular comprises a list of trees for planting in Idaho, offered for sale by the School of Forestry of the University of Idaho. Brief suggestions are also given relative to the selecting of trees, time to plant, planting, care, and cultivation.

Some of the constructional woods of British Guiana, L. S. HOUTENKAMP and L. P. HODGE (*Timber, Brit. Guiana, 3. ser.*, 5 (1918), pp. 56-61, pls. 2). Descriptions including weights per cubic foot, moduli of rupture and elasticity, and breaking weights of test bars are given for a number of constructional woods of British Guiana.

Manurial experiments with young rubber at Peradeniya (*Trop. Agr. (Ceylon)*, 59 (1918), No. 6, pp. 327, 328).—Data are given on commercial fertilizer experiments with rubber trees that were begun at the Peradeniya station in 1916. In the results thus far secured, as measured by the girth and height of the trees, the complete fertilizer has been superior to those in which any one of the elements has been omitted.

On the factors which influence the latex flow from *Hevea brasiliensis*, W. H. AMISZ (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 6, pp. 347-369, fig. 1).—An examination was made of the changes of the freezing point depression and of the concentration of the latex obtained at different times and at different positions as well as simultaneously at different positions from the same tree. From the data secured the author arrives at the following hypothesis:

"In many cases, and especially with trees with an abundant flow of latex, the root system is of great moment for the flow of latex. Probably the root system acts as a reservoir which is able to empty itself quickly, and afterwards during the time elapsing before the next tapping is filled again by latex which from all sides gathers in the root system."

On the use of hydrometers (metrolac and latexometer) on rubber estates J. C. HARTJENS (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 5, pp. 256-277; *Meded. Proefstat. Malang*, No. 23 (1918), pp. 23).—This comprises the results of experiments with hydrometers on different rubber estates within the

sphere of the Malang Experimental Station. The results are presented in tabular form and discussed.

The rotation of teak, H. BEERMAN (*Dept. Landb., Nijr. en Handel* [Date? *Indies*], *Meded. Proefstat. Boschic., No. 3* (1918), pp. VIII+74, pls. 12).—An investigation relative to the correct rotation for teak stands, with special reference to conditions in Java. The author's results are presented in a series of tables and are fully discussed. The literature of the subject is also reviewed.

Recent investigations on soil aeration.—II, With special reference to forestry, R. S. HOLZ (*Indian Forester, 44* (1918), No. 5, pp. 202-212, pls. 7).—A review of recent investigations on this subject, with special reference to studies conducted in India.

The economic aspect of Indian silviculture, E. MARSDEN (*Agr. Jour., Indian Sci. Cong. No., 1918*, pp. 29-35, pls. 5).—A paper on this subject presented before the Fifth Indian Science Congress, Lahore, 1918.

Afforestation and the partially disabled, T. H. MAWSON (*London: George Richards, Ltd., 1917*, pp. XII+46, figs. 23).—This constitutes the first of a series of booklets in which the author is to describe sites typical of some half dozen classes of settlement suitable for partially disabled soldiers. The site here discussed is considered with special reference to afforestation.

Our National Forests, R. H. D. BOERKER (*New York: The Macmillan Co., 1918*, pp. LXIX+238, pls. 51).—A popular account of the work of the Forest Service of the U. S. Department of Agriculture on the National Forests.

National Forest areas (*U. S. Dept. Agr., Forest Serv., 1918*, pp. 8, fig. 1).—A statistical report on National Forest areas, national monuments, national game preserves, and lands acquired in the White and Appalachian Mountains under the Weeks Law to January 1, 1918, accompanied by a map showing the location of the National Forests.

The forest regulations, A. F. FISCHER (*Manila, P. I.: Dept. Agr. and Nat. Resources, 1917*, pp. 25).—This comprises the text of the forest regulations of the Philippine Bureau of Forestry which were issued in accordance with sections 551 and 1817 of the Administrative Code of 1917.

Forest and grass fires in Louisiana, R. D. FORBES (*La. Dept. Conserv., 1918*, pp. 32, figs. 21).—In this bulletin the author shows the great losses that all classes of people in the State sustain in forest fires and gives a statistical account of the 1917 forest-fire season, together with the text of laws related to forestry and forest fires.

Wood-using industries of Quebec, R. G. LEWIS and J. A. DOCKET (*Dept. Ind. Canada, Forestry Branch Bul. 63* (1918), pp. 89, figs. 23).—An account of the wood-using industries of Quebec, based upon statistics gathered during the years 1914 and 1915. Detailed descriptions are given of the woods used in the industries, together with descriptions of the various industries and the commodities manufactured from each kind of wood.

DISEASES OF PLANTS.

The parasitic fungi of New Jersey, C. A. SCHWARZE (*New Jersey Stat. B., 313* (1917), pp. 3-226, figs. 1656).—Illustrated descriptions are given of the species of parasite fungi which are known to occur in New Jersey, studies having been made in the laboratory of all the species included.

Aspergillus fumigatus, A. nidulans, A. terreus n. sp., and their allies, C. THOM and MARGARET B. CHURCH (*Amer. Jour. Bot., 5* (1918), No. 2, pp. 141-149, figs. 3).—Technical descriptions of *A. fumigatus*, *A. nidulans*, and *A. terreus* n. sp. are given in sufficiently broad terms to include the more closely related

of these forms, some of which may eventually be separated off as varieties on physiological grounds.

Disinfection with formaldehyde. A substitute for the permanganate-formalin method, C. G. STORM (*Amer. Jour. Pharm.*, 1918, No. 1, pp. 292-297).—The author, in view of the present high price of potassium permanganate, calls attention to a method of generating formaldehyde which appears to be analogous to the permanganate method, and which is claimed to be as rapid almost as simple, less expensive, and safer. The new method depends upon the reaction between an aqueous solution of formaldehyde and a soluble chlorate (of potassium or sodium). The supposed reactions are discussed.

A serious eelworm or nematode disease of wheat. L. P. BYRES (*U. S. Dept. Agr., Off. Sec. Circ.* 114 (1918), pp. 5, figs. 6).—The author gives a description of a nematode or eelworm disease of wheat which has recently been found to cause considerable damage in certain parts of the United States, particularly in Virginia. The infection is said to be due to the nematode *Tylenchus tritici*, which, although known to occur in the United States to a slight extent for about ten years, did not become troublesome until 1918, when a loss of 10 per cent due to this cause is reported to have occurred in some fields.

For the control of this disease the author recommends the use of disease-free seed, or when this is not available treatment of the seed for 10 to 20 minutes with water heated to a temperature of 54 to 56° C. (129 to 133° F.), together with crop rotation and general sanitation.

Common diseases of garden vegetables and truck crops. M. T. COOK (*New Jersey Stat. Circ.* 89 (1917), pp. 22, figs. 13).—Brief popular descriptions are given of a number of the more common parasite and other diseases of garden vegetables and truck crops, with discussions of the value of crop rotation, sanitation, manures and fertilizers, seed-bed treatment and soil sterilization, seed selection and treatment, and spraying.

A hitherto unreported disease of okra. L. L. HARTER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 5, pp. 207-212, pl. 1, figs. 3).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the author describes a disease of okra pods which was first called to notice in 1916. The disease has not been found to affect the leaves under natural conditions, and, while spots similar to those on the pods are sometimes found on the leaves, the damage there is said to be relatively small, the greatest injury being done to the pods. The causal organism, which has been isolated and studied, is technically described as *Ascochyta abelmoschi* n. sp.

The origin of the disease is not definitely known, but it is believed to be carried on seed and may possibly have been introduced on imported seed from Russia, India, or Greece.

Potato stem lesions. H. A. EPSON and M. SHAROVANOV (*Jour. Agr. Research* [U. S.], 14 (1918), No. 5, pp. 213-229, pls. 3).—Results are given of an investigation conducted by the Bureau of Plant Industry, U. S. Department of Agriculture, on the canker-like lesions occurring on potato stems. A large number of solutions were made in the summers of 1916 and 1917 from material collected in northern Maine, and inoculation tests were made with about 50 strains and species of fungi to determine their ability to infect potato stems. The most serious infection was secured with several strains of *Rhizoctonia solani*, *Fusarium eumartii*, *F. oryzae*, *F. radicola*, *F. trichothecoides*, *F. discolor*, *Alternaria solani*, *Botrytis* sp. from potato stem, *Sclerotinia* sp. from potato stem, *Acreotragmus* sp., and *Ctenostachys* sp. In addition to the other fungi which are listed, cultures of a number of saprophytic organisms were obtained, species of *Penicillium*, *Phoma*, *Chetominium*, and other unidentified fungi being repre-

sented, but in no instance was there any evidence of pathogenicity of these organisms.

As a result of their investigations the authors conclude that neither *Helicortium solani* nor any particular species of *Fusarium* can be considered the sole agents responsible for the familiar stem and stolon lesions of the potato. Several parasitic species of *Fusarium*, as well as *Alternaria*, *Botrytis*, *Sclerotinia*, *Zygophyechus*, *Corethropsis*, *Phoma*, *Clonostachys*, *Acrostagmus*, and probably other fungi were found capable of causing lesions of potato stems.

The primary development of potato late blight during the growth of the host, J. Eriksson (*Rev. Gén. Bot.*, 29 (1917), Nos. 345, pp. 237-260; 346, pp. 365-320; 347, pp. 333-349, pls. 12 figs. 4; 348, pp. 376-389; 39 (1918), Nos. 349, pp. 16-30, fig. 1; 350, pp. 50-61).—The author reviews briefly the whole progress of studies regarding potato late blight (*Phytophthora infestans*) and gives an account of his own studies and observations on this disease.

He states that in field culture the disease appears three or four months after the planting, usually at the time of blooming. In Sweden this is approximately from the middle of July until the first of September, according to weather conditions.

At the time of the primary outbreak, late in summer, the disease is marked by large black spots and a fine grayish inflorescence on the under side of the leaves. These black spots are primary and are independent of each other. Under glass, with the potatoes planted in January, the disease may appear as early as the middle of April, in which case stem and petioles may present a dark gray appearance with partial deformation, other parts also showing characteristic abnormalities.

In the autumnal outbreak the spots show a dark central region, surrounded first by a brown ring, then by a velvety gray zone, and this by one of deep green. In this last region the only indication of disease that is apparent is a difference in the structure of the protoplasm. This shows on strong magnification dark points among the grains of chlorophyll, no trace of mycelium being discoverable in this region.

In the first phases of the disease, the grains of chlorophyll approach the stage of disintegration. At this time the plasma appears to be granular. Later the chlorophyll grains disaggregate. The plasme mass appears to become more decidedly granular and is also seen to contain nuclei. The blackening at this stage results from the disorganization of the chlorophyll grains.

In a succeeding stage the plasmic granulations aggregate in certain parts of the cells, in particular in the palisade cells, the mass occupying chiefly the internal extremity of the cells. This is the phase of maturation. The evidence is said to indicate that there are now two kinds of protoplasm present, that of the host and that of the parasite. These are intermingled in a state of symbiosis, which, inherited from the mother plant, extends itself in the newly forming cells, the fungus in this stage now constituting what is called by the author a mycoplasma. At a certain period of development of the plant the two organisms begin a contest which is won by the fungus.

The phase of maturation being complete, the plasmic body leaves the cell for the intercellular spaces, where it assumes the form of mycelium, showing there for the first time a filamentous condition. The cell wall is perforated at a point where the granulations are particularly noticeable.

The mycelial filament may develop an oogonium (female element) or an antheridium (male element). If the fungal mass issues at the outer end of the palisade cell it becomes visible as a slender filament between the cell and the epidermis. Inside such a cell at the point of exit can often be seen a vesicle partly or wholly empty. The further development of the filament follows car-

of two courses, resulting in either the formation of an oogonium or an antheridium. The conjugation of these elements when mature results in the production of oospores. These may germinate as soon as they are formed, evidently not being in any sense resting bodies, but spores for summer dissemination of the fungus.

These oospores develop, and on reaching the interior of a stoma, give rise to two or three slender branches or filaments which issue from the stoma. As soon as formed the tube produces a spore which may also develop an elongated branching filament, each branch bearing terminal or lateral spores. These spores function in a way analogous to sporangia, their contents differentiating into eight zoospores which are liberated by the splitting of the mother spore and which are able to germinate at once.

The cycle of development here described may be accomplished in about 24 hours. After this period, the most important in the life history of the fungus, the organism extends itself by means of zoospores in a very rapid and destructive manner if the external conditions are favorable.

A bibliography is appended.

Further observations on the cause of the common dry-rot of the potato tuber in the British Isles, G. H. PETHYBRIDGE and H. A. LAFLEURY (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1917), No. 21, pp. 193-212, pls. 21*). The authors have, during the past three or four years, renewed their study regarding the identity of the fungus causing potato dry-rot, ascribed in a former paper (*E. S. R.*, 20, p. 846) to *Fusarium solani*. The causal organism, however, is now asserted to be *F. caruleum*. The two species *F. oxysporum* and *F. trichothemoides*, said to be largely responsible for a somewhat similar rot in parts of America, have not been found in this connection in the British Isles up to the time of this report, though *F. arthrosporioides* and possibly other species of *Fusarium* occasionally cause dry-rot in the British Isles.

F. caruleum does not produce badronycosis of the potato plant, nor does it kill the plant by attacking the roots. It can destroy tomato fruits, but does not attack onions, mangels, carrots, parsnips, or apples. Maturity increases susceptibility. Some varieties are measurably resistant. There is no cure for affected tubers. Neither lime nor sulphur is of any value in retarding the rot.

Tomato diseases, J. GIMARD (*Rev. Min. Indus. Uruguay, 5 (1917), No. 31, pp. 423-428*).—A brief discussion is given of tomato diseases, including *Phytophthora infestans*, *Erysiphe* sp., and *Septoria lycopersici*, and of their effects and control in Uruguay.

Apple spraying experiments in 1916 and 1917, W. J. MOORE (*Maine Sta. Bul. 21 (1918), pp. 101-128*).—This publication constitutes the seventh and eighth annual reports of progress with apple spraying experiments, the earlier experiments having been noted (*E. S. R.*, 25, p. 732). In the period covered by the present publication, Ben Davis trees were sprayed. In 1916 applications were made of lime-sulphur and Bordeaux mixture, to which lead arsenate, 1 lb. to 7 gal., was added. In 1917 the treatment was confined to applications of lime-sulphur and various forms of lead arsenate and lime arsenate. The weather conditions in both years, particularly in the early part of the season when infection occurs and the distribution of scab is most rapid, are said to have been extremely favorable for the development of disease.

In 1916 every spray material used showed marked scab control. On the other hand, the efficiency of the spray materials in 1917 was exceedingly low. This is believed to have been due to the abnormal weather conditions of 1917, which delayed the first two applications. Regardless of seasonal conditions, Bordeaux mixture caused much damage both by leaf injury and by fruit russetting, although almost perfect scab control was secured.

In 1916 lime-sulphur combined with lead arsenate gave efficient scab control, but there was also a large amount of russetting. The variety Ben Davis is said to be exceedingly subject to russetting, and with any other variety equally subject to scab and less susceptible to spray injury, there is considered to be abundant evidence that spraying with either fungicide combined with acid lead arsenate will, as a rule, be exceedingly profitable. The experiments reported showed that arsenate of lead alone has considerable fungicidal value, and the same seems to be indicated of lime-sulphur when no arsenical is employed. Tests of dry lime-sulphur showed that it was about as efficient as homemade lime-sulphur of similar concentration.

In comparisons of lime arsenate and lead arsenate, the results of the experiments conducted in both seasons were decidedly in favor of lime arsenate.

The author reports that data are being collected on the effect of spray treatment on the set of fruit.

Brown rot of stone fruits (*Fruit World Austral.*, 19 (1918), No. 4, pp. 84, 86).—It is stated that the abnormal springs of the past two years have considerably increased the development of brown rot of stone fruits (*Sclerotinia cinerea*).

Brown rot in cherries controlled, G. H. CUNNINGHAM (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 1, pp. 38, 39).—The almost complete preservation of the cherry crop in a region of general infection is regarded as the result of a course of spraying with Bordeaux mixture. This was employed just after the leaves fell at a strength of 8:6:40, again just before the buds burst at a strength of 4:4:50, three times at 2:2:50 at ten-day intervals until thrips were observed, and at 10-day intervals thereafter with the mixture last named plus 1 lb. arsenate of lead. This combination spray scorched the leaves of a few trees to which it was applied when the sun was shining.

Common diseases of berries, M. T. COOK (*New Jersey Stat. Circ.* 88 (1917), pp. 12, figs. 7).—Popular descriptions are given of the diseases of blackberries, raspberries, dewberries, gooseberries, currants, strawberries, and cranberries, with suggestions for their control.

Anthraxnose [of grape], H. E. LAFER (*Fruit World Austral.*, 19 (1918), No. 2, pp. 28-30).—This is a somewhat general account of the recent recurrence of black spot of grape, which is now claimed to be the result of infection with *Mangina ampelina* (*Sphaeceloma ampelinum*, *Gloeosporium ampelophagum*), also of its methods of perpetuation and distribution, of favoring conditions, of varietal susceptibility and resistance, and of control measures.

Black spot [of grape] (*Fruit World Austral.*, 19 (1918), No. 1, p. 7).—In a brief note the history is reviewed of grape black spot, or anthraxnose, since its appearance at Mildura in 1904. It is said to have been very widespread recently along the river settlements in Victoria and South Australia. The probable influence of climatic and other conditions is discussed.

Black spot and its control, E. H. HATFIELD (*Fruit World Austral.*, 19 (1918), No. 1, pp. 8, 9).—Along with a general discussion of black spot of grape, the author presents the results of spraying experiments carried out during the last two years. He claims that winter spraying is ineffective, the spray ordinarily most effective being that applied when the clusters are open sufficiently to permit the spray to reach the stems of the fruitlets. The 6:4:50 strength is recommended for use when the clusters are open, the 3:2:50 strength when the petals have fallen.

Cacao spraying experiment, 1916-17, J. B. RORER (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 3, pp. 165-167).—The tabulated results of spraying experiments made on cacao on August 23, September 14, and October 19 with 5:5:50 Bordeaux mixture plus 5.5 oz. blackleaf 40, as here given, are consid-

ed to show that such spraying pays well, even in case of trees that are well situated. It is thought that even a single such spraying might be profitable.

Gummosis of citrus plants. M. DE FRANÇA PEREIRA CONTINHO (*Bol. Assoc. nat. Agr. Portuguesa*, 29 (1918), No. 1, pp. 28-33, fig. 1).—This is a brief account of citrus gummosis in Portugal, where its ravages are said to be great and increasing.

Observations on tulips. H. A. B. STOUT (*Jour. Hort. Soc. N. Y.*, 2 (1918), No. 15, pp. 235-243, pls. 3).—Continuing previous observations (E. S. R., 37, p. 847), study was made of the development of tulip bulbs during summer with special reference to blindness.

It is stated that during the spring of 1917 *Botrytis parasitica* (*Sclerotium* *sp.*) caused the death of numerous bulbs of tulips of several varieties, all of which had been secured from imported stock. The fungus apparently is able to gain soil containing much humus. A soft rot appears to be connected with the presence of a bacterial organism.

A fungus attack on the deodar. C. G. TREYER (*Indian Forester*, 4) (1918), No. 4, pp. 130, 131).—Having made a study of the influence of light on the growth and development of the deodar seedling, the author suggests that a fungus attack which is noted may be only a secondary cause of the trouble observed.

The blister rust of the white pines. S. J. RECORD (*Soc. Amer. Supp.*, 8) (1917), No. 219, pp. 216-218, figs. 11).—This is a brief biological and historical account of the blister rust of five-leaved pines (chiefly *Pinus strobus*, *P. monticola*, and *P. lambertiana*) due to *Peridermium strobi*. Complete eradication of Ribes, the host for the alternate form (*Peridermium eranthium ribicola*), and employment of immune pines, such as the native red or Norway pine (*P. resinosa*), are suggested upon to control the disease.

The white pine blister rust situation. W. A. MCCORMIN (*Agr. Gaz. Canada*, 1 (1918), No. 4, p. 339).—It is stated that in Ontario diseased pines have been found in but few places, but the current stage of the blister rust is very widespread, being present in 38 out of the 43 counties in the Province and in these states occurring in 120 of the 455 townships. The greatest prevalence occurs within a circle of about 60 miles radius, with Toronto as its center, with another generally infected area existing in the Ottawa-Montreal district. In Quebec out of 30 counties examined were found to contain the disease. Experimental work is planned to test the practicability of keeping down the currants and gooseberries for some distance around the pines.

Insignis pine disease. D. E. HUTCHINS (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 1, p. 37).—A disease attacking the insignis (Monterey) pine in New Zealand, apparently favored greatly by the forcing climate and rainfall, is briefly discussed as to its progress in various localities. It is thought that the infection may come from outside the island, as it is worse near the roads. It differs from the *Peridermium* disease attacking these pines in portions of South Australia and New Zealand in that the twigs and, in the second stage, the leading shoots are attacked in the case of *Peridermium*.

The South American Hevea leaf disease. J. B. ROBER (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 3, pp. 128, 121).—Noting a report by Stahl (*E. S. R.*, 38, p. 153), the author states that this disease, caused by a *Scolothrips*, has probably been present in Trinidad for a number of years. During the last four years it has extended its ravages (at first confined to nursery stock and young trees) to older Hevea trees in both Surinam and Demerara. It was at the time of this statement the most serious trouble of Hevea in this part of the world, though apparently somewhat less serious in Trinidad than in the other areas named.

Spike disease in sandal, P. M. LUSHINGTON (*Indian Forester*, 44 (1918), No. 3, pp. 114-117).—It is stated that on top of the Javadi Hills, at an elevation of 2,800 ft., is an area of spiked sandal supposedly dating back to the spring of 1916. The only clue yet found to the origin of the disease is the number of other species similarly affected which form a chain to the plains forest. Healthy sandal trees are found to have living attachments on spiked *Zizyphus anophla*, and numerous dead haustoria and scars are to be found on the attacked *Zizyphus*.

Note on *Polyporus lucidus* and its effect on the wood of the willow, P. A. VAN DER BEEK (*So. African Jour. Sci.*, 13 (1917), No. 10, pp. 506-515, pls. 6, figs. 4).—The author gives a discussion of the occurrence, synonymy, and relations of *P. lucidus*, with an account of its hosts, and in particular the pathological anatomy of *Salix* when infected with this fungus, which appears to be very common on *Acacia mollissima*, the cultivated wattle. The action of the fungus (which is said to be usually a facultative parasite) on the wood is described as a gradual digestion. Control measures are limited to the destruction of the sporophores and of all material harboring the mycelium of the fungus.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Audubon, the naturalist, F. H. HERRICK (*New York and London: D. Appleton & Co.*, 1917, vols. 1, pp. XI+451, pls. 34, figs. 14; 2, pp. XIII+494, pls. 23, figs. 12).—This history of the life and time of Jean Jacques Fougère Audubon (1785-1851), the noted American ornithologist and author of *The Birds of America* (1827-1838), includes (vol. 2, pp. 401-456) an annotated bibliography of his published writings, biographies, etc.

Five new mammals from Arizona and Colorado, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 21-26).

A new subspecies of chipmunk from the Yellowstone National Park, V. BAILEY (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 31, 32).

The house sparrow and the brown rat in the prairie Provinces of Canada. N. CRIDDLE (*Agr. Gaz. Canada*, 5 (1913), No. 4, pp. 343, 349).—A brief note, relating particularly to the occurrence of the English sparrow (*Passer domesticus*) and the brown rat (*Epimys norvegicus*) in Manitoba, calls attention to the ways in which they can be controlled.

It is pointed out that in the prairie Provinces the house sparrow requires more heat than is supplied by mere shelter in order to survive during the cold winter nights and can be controlled by eliminating any such source. The control of the brown rat, which has only recently invaded Manitoba, is much more difficult. Since these rodents congregate in the warmer buildings during winter, a concentration of attention in control work to those places is advisable.

Notes on the subspecies of *Numenius americanus*, H. C. OBERHOLSER (*Auk*, 35 (1918), No. 2, pp. 183-195).—These notes relate to subspecies of the curlew *N. americanus americanus*, one of the shore birds that has greatly decreased during the last decade, and *N. americanus occidentalis*.

The migration of North American birds, I-III, H. C. OBERHOLSER (*Bird Lore*, 19 (1917), No. 6, pp. 320-330, pl. 1; 20 (1918), Nos. 1, pp. 16-19, pl. 1; 2 pp. 145-152, pl. 1).—The first paper presents records on the migration of the cliff swallow (*Petrochelidon lunifrons*), tree swallow (*Iridoprocne bicolor*), violet-green swallow (*Tachycineta thalassina*), bank swallow (*Riparia riparia*), and rough-winged swallow (*Stelgidopteryx serripennis*); the second paper on the scarlet tanager (*Piranga erythromelas*) and the Louisiana (or western) tanager (*P. ludoviciana*); and the third paper on the summer tanager

(*P. rubra*), hepatic tanager (*P. hepatica*), purple martin (*Progne subis*), western martin (*P. subis hesperia*), Cuban martin (*P. cryptoleuca*), gray-breasted martin (*P. chalybea*), barn swallow (*Hirundo erythrogastris*), and the European chimney swallow (*H. rustica*).

Mutanda ornithologica, III, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 47-50).

A check-list of North American amphibians and reptiles, L. STEFNEGER and T. BARBOUR (*Cambridge: Harvard Univ. Press*, 1917, pp. IV+125; rev. in *Science*, n. ser., 47 (1918), No. 1218, pp. 440-442).—In the preparation of this check-list the authors have followed the lines of the A. O. U. check-list of birds (E. S. R., 24, p. 555), thus including the species and subspecies which they deem valid and of certain occurrence in North America north of the Rio Grande and in Lower California, Mex.

The genera and higher groups are in systematic sequence, the species are in alphabetical order, and no attempt is made to give synonyms. The names are followed by citations of their original appearance except in the case of such family names as are formed automatically. The reference to the original description is followed in the case of genera by the type species, in the case of species by a reference to the first appearance of the name in the combination adopted. Miller's list of North American land mammals¹ is said to have also been a valuable guide. References to Cope's works² are added. The type localities and the range of the species or subspecies, so far as it is possible to determine, are given. The review is by A. G. Ruthven.

A mollusk injurious to garden vegetables, F. C. BAKER (*Science*, n. ser., 43 (1916), No. 1100, p. 136).—The small slug *Agriolimax agrestis* is reported to have been a source of injury to garden vegetables in western New York during the summer of 1916. At Canandaigua holes were eaten into potato tubers and the full pods of string beans were eaten into and the beans consumed. Injury to potatoes was also observed at Rochester, and at Syracuse this slug was found in cauliflower in company with the smaller black slug *A. campestris*. Lettuce was also injured.

A molluscan garden pest, F. C. BAKER (*Science*, n. ser., 47 (1918), No. 1216, pp. 391, 392).—In continuation of observations of *Agriolimax agrestis*, noted above, it is stated that this pest again did considerable damage to cauliflower, lettuce, and potatoes in western New York during the summer and early fall of 1917. At Brewerton, N. Y., it was observed eating cabbage and potatoes and appears to have been a source of considerable damage in the district including Rochester, Canandaigua, and Geneva.

It is stated that injury by it can be controlled, when the depredations are confined to the surface plants, by spreading fine ashes about the plants. For those individuals that enter the ground and attack the tuber below the surface, it is suggested that if the grass surrounding the garden in which the slugs hide during the day be kept short it will prevent the slugs from hiding near the garden, and if boards are placed about the garden to serve as traps the slugs may be collected from beneath them during the day and killed.

Methods of asexual and parthenogenetic reproduction in cestodes, T. SOUTHWELL and BATINI PRASHAD (*Jour. Parasitology*, 4 (1918), No. 3, pp. 122-129, figs. 12).—The authors here discuss the following methods of asexual and partheno-

¹G. S. Miller, Jr., List of North American Land Mammals in the U. S. National Museum, 1911 (U. S. Nat. Mus. Bul. 79 (1912), pp. 455).

²E. D. Cope, The Crocodilians, Lizards, and Snakes of North America (Rpt. U. S. Nat. Mus., 1898, pp. 153-1270, pls. 36); The Batrachia of North America (U. S. Nat. Mus. Bul. 34 (1889), pp. 525, pls. 88, figs. 119).

genetic reproduction among the cestodes: (1) Internal proliferation from the wall of the cysticeroid, as seen in *Polycercus*, *Coenurus*, and others; (2) endogenous budding, as seen in Willey's *Merocercus*; (3) external budding, as exemplified in Haswell and Hill's species of *Polycercus*, *Staphylocystis*, etc.; and (4) parthenogenetic reproduction in *Ilisia parthenogenetica*, an adult tape-worm of doubtful affinities.

Entomological notes on the Surrey Pine District, R. W. ADKIN (*Quart. Jour. Forestry*, 11 (1917), Nos. 2, pp. 81-88; 3, pp. 149-160; 4, pp. 217-237; 12 (1918), No. 2, pp. 80-98).—The third of the four papers presents notes on certain insects of the families Hymenoptera, Coleoptera, Lepidoptera, and Hemiptera attacking conifers and their occurrence in the Surrey Pine District. The list of Lepidoptera is said to be approximately complete; the list of and notes on the Aphididae (pp. 232-235) were compiled by F. V. Theobald.

A brief account of the most important agricultural pests of Uganda, C. O. GOWDLEY (*Kampala, Uganda: Mengo Planters, Ltd.*, 1917, pp. 132, pl. 1).—The several parts of this work relate to boring beetles of economic importance; a descriptive catalogue of scale insects, together with recommendations for their control; termites; insect pests of cacao; and insect pests of coffee. Plant and general indexes are included.

[Report of the] entomological branch, W. W. FROGGATT (*Rpt. Dept. Agr. N. S. Wales*, 1917, pp. 30-33).—A brief report of the work of the year.

Studies on the insect enemies of cacao and other cultivated plants on the island of Sao Thomé, A. F. DE SEABRA (*Mem. Soc. Portugaise Sci. Nat.*, 3 (1917), No. 1, pp. 28, pl. 1, figs. 24).—The following papers are included: Some Observations on Scale Insects Attacking the Leaves of Cacao (pp. 3-13); The Occurrence of *Lecanium viride* and *Cephalosporium lecanium* in Sao Thomé (pp. 13-15); Note on *Aspidiotus articulatus* and *A. palmæ* (pp. 16-18); Some Observations on *L. nigrum* (pp. 19-21); On the Occurrence of *Orthozia insignis* in Sao Thomé (pp. 22-24); and Some Observations on *Ncoterмес griseol* and *Microtermes parvus theobromæ* (pp. 24-28).

Light traps as a means of controlling insect pests, N. CRIDDLE (*Canad. Ent.*, 50 (1918), No. 3, pp. 73-76).—This discussion includes a table which records the captures for August and September, extending over a period of three years and ended with 1917.

Spraying formulas for garden insects, A. L. MELANDER (*Wash. State Col. Ext. Dept.*, Ser. 1, No. 35 (1918), pp. 16, figs. 10).—This brings together practical information for ready reference.

An ecological study of the May fly *Chironetetes*, W. A. CLEMENS (*Univ. Toronto Studies, Biol. Ser.*, No. 17 (1917), pp. 43, pls. 5, figs. 5).—A report of studies of *C. albomanicatus* made in the vicinity of Ithaca, N. Y.

The control of grasshoppers in New York State, G. W. HERRICK and C. H. HADLEY, JR. (*N. Y. State Col. Agr.*, Cornell Ext. Bul. 4 (1916), pp. 71-79, figs. 8).—A popular summary of measures applicable in grasshopper control.

The egg-laying habits of some of the Acrididae (Orthoptera), N. CHAPPLE (*Canad. Ent.*, 50 (1918), No. 5, pp. 145-151).—Notes are given on the oviposition of a number of species of Orthoptera in Manitoba, including five species of Edipodinae (*Arphia pseudonietana*, *Camnula pellucida*, *Dissosteira carolina*, *Spharagemon collaris*, and *S. bolli*) and four species of Locustinae (*Melanoplus atlantis*, *M. angustipennis*, *M. packardii*, and *M. bivittatus*).

The value of *Coccobacillus acridiorum* in the destruction of locusts, B. BARA (*An. Soc. Rural Argentina*, 51 (1917), No. 5, pp. 385-387).—A summary of recent work with this organism in the control of locusts, accompanied by a list of 15 references to the literature.

Studies on the harlequin bug, F. B. PADDOCK (*Texas Sta. Bul.* 227 (1918), pp. 1-65, pls. 5, figs. 4).—This is a detailed report of studies of the biology of the harlequin cabbage bug, including a bibliography of five pages. Much of the data is presented in tabular form.

The harlequin cabbage bug is found over the entire State of Texas, being injurious to many garden and truck crops, including cabbage, cauliflower, collard, mustard, and turnip. "The egg stage of the spring brood was found to be 11.2 days, of the summer brood 5.2 days, of the fall brood 4.91 days. The period of maturity of the spring brood was 46.3 days, of the summer brood 30.9 days, of the fall brood 35.6 days. The length of the adult life of the spring brood was 91.5 days, of the summer brood 87.7 days, and of the overwintering brood 171 days. At College Station there are three complete generations of the harlequin bug in a year, with a partial fourth brood. There was an average mortality of hibernating bugs at College Station of 22 per cent. There were no parasites or predaceous enemies observed that are of economic importance. Artificial control must be used against this pest. Such measures as fall destruction, winter treatment, spring destruction, and clean culture must be used. Remedial measures consist of hand picking and spraying."

The genus *Corythucha* (Tingidae; Heteroptera). E. H. GIBSON (*Trans. Amer. Ent. Soc.*, 44 (1918), No. 1, pp. 69-104).—Of the 57 species of *Corythucha* here recognized, 21 are described as new to science.

The genus *Hadronema* (Miridae; Heteroptera). E. H. GIBSON (*Canad. Ent.*, 50 (1918), No. 3, pp. 81-84).—The author recognizes seven species of flower bugs of this genus, of which two are described as new.

Control of plant lice in the vegetable garden. H. D. BROWN (*Illinois Sta. Circ.* 227 (1918), pp. 4, fig. 1).—A popular summary of information.

Eastern aphids: A few species of *Prociphilus*, EDITH M. PATCH (*Maine Sta. Bul.* 279 (1918), pp. 45-100, pls. 2).—After calling attention to the fact that the complete American food cycle has been ascertained for but two of the species of *Prociphilus* found in New England, namely, *P. tessellata* and *P. venafuscus*, the author presents brief notes on several species (pp. 45, 46). A full migrant of a species found in 1912 congregating in enormous numbers about the base of mountain ash at Orono, Me., is apparently *P. fitchii* of Baker and Davidson. A root species common on certain Composite in Maine is thought to be *P. (Trama) frigiderensis* and to be the root form of a species present in spring upon other vegetation from which it migrates—possibly hawthorn or Juneberry.

The greater part of the bulletin is taken up by part 5 of the food plant catalogue of the Aphidæ of the world (E. S. R., 31, p. 157).

Are there different races of vine phylloxera? B. GRASSI and M. TOPI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5, ser. 26 (1917), 1, No. 5, pp. 265-273; abs. in *Internat. Inst. Agr.* [Rome], *Internat. Rev. Sci. and Pract. Agr.*, 5 (1917), No. 9, pp. 1322-1327).—The experiments of Börner led the authors to undertake the investigations here reported with a view to determining the different ways in which the phylloxera spreads in Italy.

Aphis saliceti, Siphocoryne pastinacæ, and allied species, C. P. GILLETTE and L. C. BRAGG (*Canad. Ent.*, 50 (1918), No. 3, pp. 89-94, figs. 20).—This paper gives the results of the authors' studies of six species of aphids that are quite similar in general appearance. One, *Aphis theobaldi*, from celery at Webster, Mass., and on *Heracleum* sp. flower heads at Geneva, N. Y., is described as new, and a new name, *Siphocoryne essigi*, is given to a previously described species, *Hyadaphis pastinacæ*.

New Aphididae from California, A. F. SWAIN (*Trans. Amer. Ent. Soc.*, 44 (1918), No. 1, pp. 1-23, pls. 2).—Nine species of California aphids are described; as new to science, several of which appear to be of economic importance.

Report on progress of trench fever investigations, R. P. STRONG ET AL. (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 22, pp. 1597-1599).—This is a report of experimental work by the trench fever commission of the medical research committee of the American Red Cross conducted at a stationary hospital in France in which tests were made upon 68 of numerous Americans who volunteered.

The results have shown the disease to be caused by an organism, which has not thus far been shown to be filterable, in the blood and particularly in the plasma. While the disease can be produced by injection of blood or by louse (*Pediculus corporis*) infection, it appears that the infection is transmitted naturally by the louse and apparently this is the important and common means of transmission.

"Thirty-four men have been employed in the blood inoculation experiments, and these have been inoculated either with blood or some constituent element of it taken from trench-fever cases in the febrile stage of the disease. Of these, 23 have developed typical trench fever. Sixteen of these were inoculated with whole blood, of which number 15 have developed the disease. . . .

"In relation to transmission of the disease by the louse *P. corporis*, 26 men have been subjected to experiment. Of these, 22 have harbored lice which have bitten trench-fever patients in the febrile stages of the disease, and the remainder have harbored, for the same period of time, normal, uninfected lice which have not bitten trench-fever patients. . . . So far, 12 of the individuals who have harbored the infected lice in this manner have contracted the disease. The time which elapsed from the date when the lice were first placed on these individuals to the date of the beginning of the disease has been: One case, 16 days; one case, 17 days; two cases, 19 days; one case, 20 days; two cases, 21 days; one case, 25 days; three cases, 26 days. [Subsequently there were also two additional cases, one of 30 days and one of 35 days.] . . . The disease produced by inoculation of the blood or by the louse infection is apparently the same. . . . The investigations and experiments have also demonstrated that trench fever is a specific disease and is not a form of typhoid fever."

Studies of muscoid larvæ entoparasitic in arthropods, I-II, J. C. NIELSEN (*Vidensk. Meddel. Dansk Naturhist. For. i Kjøbenhavn*, 63 (1911), 1-26, pl. 1, figs. 19; 64 (1912), pp. 215-248, figs. 41).—Accounts are presented in the first paper on the biology of *Carcelia gnava* reared from *Stilpnottia salicis* and *Malacosoma neustria*, *Exorista blepharipoda* from the caterpillars of (*Acraspota*) *Apatela psi* and *A. tridens*, *Meigenia floralis* from larvæ of the chrysomelid beetle *Gastrophysa viridula*, and *Actia pilipennis* from the European pine shoot moth (*Retinia*) *Eretia buoliana*.

The second paper records the rearing of the larvæ of the first generation of *Phryxe vulgaris* from caterpillars of *Cheimatobia brumata*, *Hibernia defoliaria*, and *Dryobota protea*; and those of the second generation from (*Orgyia*) *Hemerocampa antiqua*, *Eremobia ochroleuca*, and *Eupithecia innotata*; *Tachina larvarum* from *Zygana filipendula*; *T. impotens* from caterpillars of *H. antiqua*; *T. macrocera* from caterpillars of *Dasychira groenlandica* and *Malacosoma castrensis*; *T. vidua* from the caterpillar of *Macrothylacia rubi*; and *Diponochata setipennis* from an undetermined caterpillar and in numbers from full-grown earwigs (*Forficula auricularia*). About 50 per cent of *S. salicis* on willows was parasitized by *C. gnava* in 1909, and in 1910 but few caterpillars were seen.

Studies of muscoid larvæ entoparasitic in arthropods. VI. J. C. NIELSEN (*Vidensk. Meddel. Dansk Naturhist. For. i Kjöbenhavn*, 68 (1917), pp. 23-36, figs. 20).—This paper includes accounts of *Panzeria minor* n. sp. parasitic in the caterpillars of *Taniocampa pulverulenta* and *Calymnia trapezina*; *Winthemia quadrupustulata* reared from caterpillars of *Vanessa io*, *V. urticae*, *Cucullia lychni-tidis*, and *Brotolomia meticulosa*; *Frivaldskia distincta* reared from caterpillars of *Drepana falcata*, *Ematurga atomaria*, *Calata fusaria*, *C. cranthemata*, *Cidaria corylata*, *Tephrocystia indigata*, and *Sphinx pinastri*; *Campylocheta obscura* parasitic in the caterpillars of *Crocotia linguaria*; *Tachina rustica* reared from the larvæ of an undetermined sawfly feeding on clover; and *Goniocera enigmatica* parasitic in *Malacosoma castrensis*.

The pathological effects of *Phthirus pubis*. G. H. F. NETTLE (Parasitology, 10 (1918), No. 3, pp. 375-382).—The author considers the pathological effects of *P. pubis* under the headings of general effects of parasitism, experimental observations on the effects of *Phthirus* bites, and melanism.

Parthenogenesis in silkworms. A. LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 5, pp. 192-194; abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 10, p. 1392).—A report of further studies (E. S. R., 36, p. 459) during 1916 and 1917 on the change in color which occurs normally in certain unfertilized eggs of *Bombyx mori*, and on the formation in this species of larvæ of parthenogenetic origin.

Parthenogenesis in the silkworm. A. LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 23, pp. 799-801).—In continuation of work noted above the author finds that diverse races or varieties of *Bombyx* differ in their liability to parthenogenetic development.

The alfalfa looper (*Autographa californica*), A. GIBSON (*Agr. Gaz. Canada*, 5 (1918), No. 2, pp. 132-136, figs. 2).—An account of the life history and habits and morphology of this lepidopteran, which is widespread in distribution in western North America, occurring in Canada in the Provinces of British Columbia, Yukon, Alberta, and Manitoba. The caterpillars occurred in Canada in numbers sufficient to cause serious injury to crops in 1911 for the first time. Studies of the species in Washington State by Hyslop have been previously noted (E. S. R., 28, p. 253).

The pink bollworm in Brazil. E. C. GREEN (*A. Lagarta Rosada das Capulhoas no Brasil. Rio de Janeiro: Soc. Nac. Agr.*, 1917, pp. 23, figs. 131).—Noted from another source (E. S. R., 38, p. 562).

The bud moth (*Agr. Gaz. Canada*, 5 (1918), No. 2, p. 155).—Experiments conducted by the department of biology of Macdonald College are said to have shown that two sprayings with arsenate of lead before blossoming time were quite effective in controlling the eye-spotted bud moth. This insect is probably more destructive to the apple than is the codling moth in western Quebec.

Control of cabbage worms. H. D. BROWN (*Illinois Sta. Circ.* 225 (1918), pp. 1).—A popular account of the imported cabbage worm and cabbage looper and means for their control.

On the occurrence of a cephaline gregarine, *Leidyana tinei* n. sp., in lepidopterous larvæ. D. KEILIN (*Parasitology*, 10 (1918), No. 3, pp. 406-410, pl. 1, fig. 1).—The gregarine here described lives in larvæ of the diachistid moth *Endrosis fenestrella*, found in the nests of the house martin (*Helidon urtica*).

Vegetable powder as a larvicide in the fight against mosquitoes. —A preliminary note, J. K. THIBAUT, JR. (*Jour. Amer. Med. Assoc.* 76 (1918), No. 17, pp. 1215, 1216).—In investigations as an agent of the Bureau of Entomology of the U. S. Department of Agriculture the author has found that a powder made from dried weeds and grasses when spread quickly and evenly over the surface

of water is very effective for killing such well-known species of mosquitoes as *Anopheles quadrimaculatus*, *Culex quinquefasciatus*, *C. abominator*, *Aedes columbianae*, and *Psorophora cyanoescens*. "Of these the species with short, thick air tubes such as *Anopheles*, *Aedes*, and *Psorophora* are easily killed, while the species of *Culex* with very long, slender tubes are more resistant, *C. abominator* being the most resistant species I have had to deal with."

A trematode parasite of anopheline mosquitoes, M. B. SOPARKAR (*Indian Jour. Med. Research*, 5 (1918), No. 3, pp. 512-515).—In the note by Sinton (E. S. R., 33, p. 562) on a trematode parasite of anopheline mosquitoes the author recognizes a resemblance to similar encysted trematodes which he has found on the fins of certain fresh-water fish as well as in the bodies of snails, chiefly *Planorbis erustus*. The author's observations have shown that these parasites are the encysted forms of certain cercaria which are widely distributed in ponds and puddles in the suburbs of Bombay, being derived from *P. erustus*. Of 7,194 of these snails examined 1,422, or approximately 20 per cent, were found infested by them. In tests made he has found it possible to infest *Anopheles* and to a less extent *Culex* mosquitoes with the encysted parasite, but it apparently does not undergo any development in the mosquito. "Sinton's observations meanwhile have added one more link to the rather complicated life history of this parasite, and it is interesting to note that the encysted forms should be found in mosquitoes and their larvæ, while further development takes place in certain fish which are known to be mosquito destroyers."

The western newt or water-dog (*Notophthalmus torosus*), a natural enemy of mosquitoes, A. C. CHANDLER (*Oregon Sta. Bul. 152* (1918), pp. 3-24, figs. 61).—Casual observations of this salamander, indicating that it might be an important factor in the control of mosquitoes in the Willamette Valley, Oreg., led to the series of observations and experiments here reported.

A general account is first given of its life history and habits, based largely upon studies by Ritter reported in 1897.¹ It is pointed out that the habits of the species change with the season. The adults are entirely aquatic during the greater part of the year, living in lakes, reservoirs, slow-flowing streams or sloughs, or any other quiet body of water of sufficient size. In October or November in the vicinity of Corvallis they leave the water and wander about on land, being commonly found crawling about in dead leaves in patches of woods. In November or December they retreat to cavities under stumps, logs, or stones, where they curl up to spend the cold portion of the winter, sometimes a dozen or more together, and on warm days come forth and wander about in search of food. In the vicinity of Corvallis the males return to water and assume the breeding characteristics as early as January 1, whereas the females can seldom be found in water before February.

The author's studies deal particularly with the food habits, which are considered under the headings of field observations, stomach examinations, and experimental feeding. The experiments show that a single water-dog may consume more than 200 large mosquito larvæ in the course of 24 hours. Many additional larvæ appear to be killed by the salamanders, which, after the stomach is filled, often seize and chew the larvæ without swallowing them. One individual observed destroyed nearly 400 mosquito larvæ and pupæ within 24 hours. It is pointed out that in spite of the great capacity for food, particularly of the adults, water-dogs are able to go for weeks or even months without food and show no apparent discomfort from this fasting. In the experiments conducted the only kind of food which was definitely given preference over mosquitoes was tadpoles and larval salamanders.

¹Proc. Cal. Acad. Sci., 3. ser., Zool., 1 (1897), pp. 73-114.

The study has led the author to suggest the extensive use of water-dogs as mosquito destroyers in rain barrels, water barrels on trestles, etc.; water troughs; borrow pits, blocked swamps, etc.; reservoirs, mill ponds, garden pools, etc.; irrigation ditches; and rice marshes.

A list is given of 8 references to the literature.

Some bloodsucking flies of Saskatchewan, A. E. CAMERON (*Agr. Gaz. Canada*, 5 (1918), No. 6, pp. 556-561, figs. 6; *Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 5, pp. 632-638).—This is a report of a preliminary survey of the bloodsucking flies, including the *Culicidae*, *Simuliidae*, and *Tabanidae*, affecting live stock and man, made within a radius of 50 miles of Saskatoon during 1917.

Studies on the screw worm fly, *Chrysomya macellaria*, in Panama, I. D. DUNN (*Jour. Parasitology*, 4 (1918), No. 3, pp. 111-121).—The screw worm is found in great abundance throughout the Canal Zone and Panama and is of considerable economic importance. The author discusses its attack on man and animals, emergence of larvæ when buried in the ground, transmission of disease by it, breeding out larvæ from cases of myiasis, and preventive and control measures.

Phytomyza flavicornis, a dipteran injurious to the Milan cabbage in Lombardy, C. DEL VECCHIO (*Natura [Milan]*, 8 (1917), Jan.-Apr., pp. 75-77, figs. 2; *ibid.*, in *Internat. Inst. Agr. [Rome]*, *Internat. Rec. Sci. and Pract. Agr.*, 8 (1917), No. 7, p. 1069).—A large proportion of Milan cabbage in a big plantation was found, in September, 1915, to have been injured by attacks of this dipteran (*P. flavicornis*).

A partial key to species of the genus *Agromyza*, J. R. MALLOCH (*Canad. Ent.*, 54 (1918), Nos. 3, pp. 76-80; 4, pp. 130-132).—The author divides the genus *Agromyza* into arbitrary groups and gives a key with each. Four species are described as new to science.

Seventeenth annual report of the Illinois State Beekeepers' Association, compiled by J. A. STONE (*Ann. Rpt. Ill. Bee Keepers' Assoc.*, 17 (1918), pp. 124, figs. 19).—The proceedings of the association are presented.

The control of European foulbrood, E. F. PHILLIPS (*U. S. Dept. Agr., Farmers' Bul.* 975 (1918), pp. 16, fig. 1).—A popular account of European foulbrood with preventive and remedial measures.

Pollination of alfalfa by bees of the genus *Megachile*, F. W. L. SLADEN (*Agr. Gaz. Canada*, 5 (1918), No. 2, pp. 125, 126, figs. 4).—The author reports the finding, both at Redcliff and Lethbridge, Alberta, of a leaf-cutter bee (*Megachile latimanus*) which visits fields of alfalfa in bloom in considerable numbers, tripping the flowers at a rate of 17 flowers per minute. This species was more numerous in the alfalfa fields than five other species of *Megachile* together, all of which perform the same service. Several species of humblebees, fairly plentiful, worked more slowly and often failed to trip the flowers. Honeybees, also plentiful, visited the flowers without tripping them. Similar observations were made at Summerland and Keremeos, B. C., but *M. perihirta* was the abundant species.

Two important introduced parasites of the brown-tail moth, C. F. W. MEYER RECK (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 5, pp. 191-205, pls. 4).—The present paper deals with studies by the Bureau of Entomology of the U. S. Department of Agriculture of the bionomics of *Apanteles lactecolor* and *Meteorus versicolor*, both of which are widely distributed in Europe and have spread rapidly in this country since their introduction, having been recovered from practically the entire brown-tail moth area.

A. lactecolor, which hibernates in young caterpillars of the brown-tail moth, was described by Viereck in 1911 from material reared at Melrose Highlands,

Mass, having apparently been undescribed prior to that time, although a widespread and general parasite of the brown-tail moth caterpillars in Europe.

The female oviposits in first and second stage brown-tail moth caterpillars during the month of August, when a single female may attack upward of 200 caterpillars. The larva hatches out in about 3 days and feeds slightly on the fat and lymph there, merely keeping pace with the very slow development of the caterpillar prior to hibernation. Dissections have shown that when *A. lacteicolor* enters into competition with either or both of the two other parasitic species that pass the winter in the same host, namely, a tachinid, *Zygobothria nidicola* and *M. versicolor*, its competitors are killed before midwinter. On the resumption of the feeding by the host in the spring the small larvae of *A. lacteicolor* become active and begin in earnest the task of destroying their hosts. The death of the host occurs in from 7 to 12 days after they have begun feeding, just prior to the issuance of the parasite. The cocoon of this parasite is completed in 3 hours or more following issuance from the host, pupation taking place in about 48 hours after the larva has ceased spinning. The total length of the period spent in the cocoon is from 5 to 8 days.

In investigations of the summer hosts of this parasite, the author found that the gipsy moth is the only one acceptable to *A. lacteicolor*, which is available at the time of the appearance of the adult parasites of the first generation. These gipsy moth caterpillars are attacked in the first or second stage and are killed by the parasite before they have passed the third. In the case of the summer generations development from egg to adult averages from 19 to 20 days, the adults emerging during the last weeks of June and in early July. After emergence from the gipsy moth caterpillar, between which date and the time of oviposition in the hibernating caterpillars of the brown-tail moth there is a period of more than one month, several other lepidopterous hosts are parasitized by *A. lacteicolor*, of which *Apatela hasta*, a noctuid not uncommon upon wild black cherry, is said to be the most important. It is considered an admirable host for tiding *A. lacteicolor* over the period elapsing before the brown-tail moth caterpillars that are to carry the parasite over the winter become available. The economic importance of this parasite is considerable, as high as 20 to 25 per cent of the brown-tail moth larvæ of a web being parasitized. Mention is made of several hyperparasites.

M. versicolor, described by Wesmæl in 1835, is much similar in habits to *A. lacteicolor*. The larva feeds very slightly in the fall, increasing scarcely at all in size, and passes the winter in the first stage within the body cavity of its host. When the brown-tail moth caterpillars begin feeding in the spring the larvæ of *M. versicolor* also become active, the cocoons appearing in from 10 to 14 days. The period from the issuance from the host to emergence from the cocoon is 7 to 9 days, while the pupal period alone is 4 to 6 days. The adults of the first generation emerge during the first two or three weeks of June. Mention is made of a number of summer hosts. In New England the adult parasites of the first generation evidently prefer the last two stages of the brown-tail moth caterpillars for oviposition. It is said that there is unquestionably a partial third generation on various native hosts. As a parasite of the hibernating brown-tail moth caterpillars *M. versicolor* is much inferior to *A. lacteicolor*, destroying on the whole only a small percentage of them.

An interesting new hymenopterous parasite, *A. E. GAHAN* (*Canad. Ent.*, 50 (1918), No. 5, pp. 151, 152).—Under the name *Aphelopus thelie* the author describes a new bethylid of the subfamily Dryininae parasitic on *Thelia bimaculata* at Cold Spring Harbor, N. Y.

Ichneumonoid parasites of the Philippines, II, C. F. BAKER (*Philippine Jour. Sci.*, Sect. D, 12 (1917), No. 6, pp. 383-422).—The present paper (E. S. R., 29,

p. 468), dealing with the genus *Rhogas* [Rhogadinae (Braconidae)]. Includes descriptions of 17 species new to science and the new subgenus *Aleirhogas*.

Parasitic Hymenoptera from the British Solomon Islands, collected by Dr. W. M. Mann, C. T. Bates (*Bul. Mus. Compar. Zool.*, 61 (1918), No. 3, pp. 97-130, pl. 1).—This paper includes descriptions of 21 species new to science.

Prospaltella berlessei* against *Diaspis pentagona. Observations in Piedmont during 1916, P. VOGLINO (*Abst. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 1966, 1967).—A report upon studies of *P. berlessei* in Piedmont in 1916.

Lectotypes of the species of Hymenoptera (except Apoidea) described by Abbé Provancher, A. B. GAHAN and S. A. ROHWER (*Canad. Ent.*, 49 (1917), Nos. 9, pp. 298-308; 10, pp. 331-336; 11, pp. 391-400; 12, pp. 427-431; 59 (1918), Nos. 1, pp. 28-33; 3, pp. 101-106; 4, pp. 133-137; 5, pp. 168-171; 6, pp. 196-201).

Some ladybird beetles destructive to plant lice. W. A. ROSS (*Agr. Gaz. Canada*, 5 (1919), No. 4, pp. 344-347, figs. 2).—These notes relate to the morphology and biology of several of the 25 species of lady beetles collected in the Niagara district of Ontario, namely, *Adalia bipunctata*, *Coccinella 9-notata*, *C. 5-notata*, *C. trifasciata*, *Hippodamia 13-punctata*, *H. convergens*, *Megilla maculata*, and *Anatis 15-punctata*.

***Oryctes rhinoceros* in the Philippines**, D. B. MACKIE (*Philippian Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 315-334, pls. 3).—This is a report of studies of the rhinoceros beetle, particularly of its life history and bionomics and its control.

***Coelocides fuliginosus*, a coleopterian injurious to the poppy in Austria**, R. RAVNINGER (*Ztschr. Angew. Ent.*, 3 (1916), No. 3, pp. 383-387; *abst. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 1968, 1969).—Injury to poppies observed in late May and early June, in which numerous plants in a plantation of poppies had turned yellow and subsequently died, was found to be due to *C. fuliginosus*. The larva of this beetle attacks the roots and hollows out either round holes or open galleries 1 to 1.5 mm. in depth, it generally being found in the upper half of the root, sometimes down to a depth of 8 cm. (about 3 in.) beneath the soil. Examination by the author showed 60 per cent of the plants to harbor one larva, 38 per cent 2, and 2 per cent 3 larvae.

The round-headed apple-tree borer, *Saperda candida*, G. G. BECKER (*Arkansas Sta. Bul.*, 146 (1918), pp. 3-93, pl. 1, figs. 69).—This is a report of studies of the biology and control of the round-headed apple-tree borer conducted in the Ozark fruit district in Arkansas.

The species was found to have a 2-year life cycle in the Ozarks. Under normal conditions the eggs require about two weeks for incubation. The larvae attain their full growth by the end of the second season; the number of larval instars vary, but there may be at least six. Pupation was found to begin in the latter part of March and may continue up until the middle of June, but most of the larvae pupate in April. The pupal stage lasts from 12 days to 6 weeks, requiring an average of 3 weeks. The adults remain in the tree for about 10 days after transformation, during which time they may feed to some extent in the pupal cell. Adults attain sexual maturity about 10 days after emerging.

Beetles feed extensively upon the bark of twigs, on the ribs of leaves, and even on the fruit during the time that they are at large in the orchard. This suggests poisoning as a means of control. Females normally deposit their eggs in the trunks of apple trees within about 0.5 in. of the ground. Eggs may be deposited higher up on the trunk and, under caged conditions, have also been deposited in twigs and in the fruit. Our limited data suggest that an average female may deposit from 40 to 50 eggs, though we had one beetle deposit 93.

Beetles apparently do not discriminate between healthy and sickly trees when depositing eggs. Beetles apparently do not manifest any preference as between the different varieties of apples when depositing eggs. Beetles prefer to deposit eggs in trees between the ages of 3 and 10 years. The duration of the adult stage ranges from 1 to 2 months. Borers are worse in neglected orchards. Borers are worse in orchards set out on recently cleared land.

"A test of various tree protectors gave best results with an asphaltum linseed oil combination which could be applied at a temperature of about 115° C. [239° F.]. The temperature of melted asphaltum may cause severe injury to young trees and consequently should not be applied to trees under 4 years of age. If the reddish castings found above the ground, at the base of some of the infested trees, are used as a guide for pointing out infested trees, 80 per cent of the latter are likely to be overlooked.

"As a result of investigations reported in this bulletin our recommendations for the control of this insect are (1) worming the trees in early August (for the Ozarks) and in April; (2) spraying young trees with a view to poisoning the adults, and (3) the protection of trees which are a few rods from a source of infestation with an asphaltum-linseed oil combination which can be applied at a temperature of not over 115°."

Recent investigations of this pest by Brooks have been previously noted (E. S. R., 33, p. 369). A bibliography of ten pages, prepared by E. H. Dushum, is appended.

A new *Hoplia* from Florida, W. S. FISHER (*Canad. Ent.*, 50 (1918), No. 4, pp. 140-142).

The bean weevils, T. J. HEADLEE (*New Jersey Stat. Circ.* 91 (1917), pp. 3-6, figs. 4).—A popular account of the bean weevil, cowpea weevil, four-spotted bean weevil (*Bruchus quadrimaculatus*), and European bean weevil (*B. rufimanus*), with control measures.

Synopsis of British Strepsiptera of the genera *Stylops* and *Halictoxenus*. R. C. L. PERKINS (*Ent. Mo. Mag.*, 3, ser., 54 (1918), Nos. 39, pp. 67-72; 40, pp. 73-76, pl. 1).—Eleven species of *Stylops* and 3 of *Halictoxenus* are recognized from Great Britain, of which 5 of the former and 2 of the latter are described as new to science. A table for the separation of the males of the genus *Stylops* is included.

Gall insects and their relations to plants, E. P. FULT (*Sci. Mo.*, 6 (1918), No. 6, pp. 509-525, figs. 34).—A general account.

Cheese mites, NELLIE B. EAMES (*Jour. Bd. Agr. [London]*, 24 (1918), No. 16, pp. 1087-1096, pl. 1).—A summary of information on four species of mites that attack cheese, namely, the Cheddar mite (*Carpoglyphus anonymus*), and the Stilton and Cheddar mites (*Tyroglyphus siro*, *T. longior*, and *Aleurobium farinae*).

Observations and experiments conducted with a view to ascertaining the manner in which new cheeses become infected in a cheese room previously attacked, how mites spread from cheese to cheese and from shelf to shelf, the effect of natural conditions on mite attack, and to find some substance that will exterminate the mites on an attacked cheese are reported. It was found that brushing attacked cheeses daily and removing the mite dust considerably lessens the seriousness of the attack. "Fumigating the cheese room with carbon bisulphid in the proportion of 1 lb. of bisulphid to every 500 cu. ft. of space during August or September will keep the mites under control, though it is unlikely that it will succeed in exterminating them. There should be at least two fumigations, the second about 12 to 14 days after the first. A third fumigation after the same interval is advisable. Painting the surface of the cheeses with the bisulphid is the only way of getting rid of the mites altogether. Three such paintings at intervals as above are necessary."

FOODS—HUMAN NUTRITION.

Nutritive factors in animal tissues. I. T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 399-423, figs. 51.)—The products of animal and vegetable origin which have been found to contain either the fat-soluble or water-soluble vitamin have been tabulated with references to the original literature, and the results of further investigations as to the occurrence of the water-soluble factor in certain animal products are reported. Beef muscle, meat extract, the tissue residue from this meat extract, and dried pig liver were investigated by the authors, following the plan of their earlier studies with rats.

The results of the nutrition experiments show that both the meat powder and the meat residue seem to be deficient in the water-soluble food hormone, although both are suitable as sources of protein in the diet when the other essential ingredients are present in sufficient amounts. The meat extract was found to contain at least a small amount, and the dried pig liver a large amount, of the water-soluble vitamin as well as adequate protein.

It is pointed out that the results parallel the findings of Cooper (E. S. R., 31, p. 762) in respect to the relative antineuritic properties of muscle and liver, and agree with those of Eddy (E. S. R., 36, p. 165) on the growth-promoting properties of the water-soluble extract of the pancreas. The adequacy of both the meat powder and the meat residue as sources of protein is emphasized in view of the fact that meat residues after the preparation of soups from muscle tissue are often discarded as inferior food products.

Nutritive factors in plant tissues.—I. The protein factor in the seeds of cereals, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 521-535, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657; *Jour. Soc. Chem. Indus.*, 37 (1918), No. 17, p. 526 A).—The authors point out that in feeding experiments no adequate comparison between the value of different proteins can be made unless the quantity of protein actually eaten is known. To determine the relative value of the total protein in some of the commonly used cereals, feeding experiments were conducted with rats, the protein of the diet being supplied by protein concentrates from the cereal under investigation prepared by removing the starch by the action of diastase. Concentrates of rice, barley, corn, and wheat were tested.

The preliminary results which are reported offer evidence that "the total proteins of rice and barley, in contrast with maize and oats, when furnished in diets containing 16 to 17 per cent of protein, supply enough of all the amino acids essential for growth." It is stated, however, that the experiments reported indicate that it ought to be possible to make an animal grow on a diet in which the maize kernel is the sole source of protein, provided a preparation of the total proteins could be obtained which would permit feeding them in sufficient quantity so that enough of those amino acids which are present in certain of the proteins and not in others would be available to meet the minimum nutritive requirements of the organism.

It was found that the amino acid deficiencies of the protein concentrate of oats could be supplemented by casein or gelatin, the former proving the more satisfactory.

A biological analysis of pellagra-producing diets.—II. The minimum requirements of the two unidentified dietary factors for maintenance as contrasted with growth, E. V. McCOLLUM and NINA SIMMONDS (*Jour. Biol. Chem.*, 32 (1917), No. 2, pp. 181-193, pls. 3, figs. 3).—Continuing the study of pellagra-producing diet (E. S. R., 30, p. 266), the authors report the results of a series of experiments designed to show the magnitude of the interval between the require-

ments of young rats for fat-soluble A and water-soluble B for maintenance, as contrasted with growth, and also a series of tests with full-grown rats for the purpose of comparing the maintenance requirement of adult with that of young tissues. From the experimental data the following conclusions are drawn:

There is no low plane of intake of either fat-soluble A or water-soluble B which can be said to maintain an animal without loss of vitality. More than the minimal amount necessary for the prevention of loss in weight must be used if the diet is continued for any length of time. Within certain limits growth is proportional to the supply of both factors, all other factors being properly adjusted. A low intake of either factor can be tolerated much better with an otherwise excellent diet than with one which is less well constituted. An attempt to fast an individual selectively for one or both of these dietary essentials is a dangerous procedure.

The authors assert that efforts directed toward the control of tumor growth by eliminating growth factors from the diet can never become of practical value, as the life of the host will be cut short if the experimental conditions imposed are sufficiently rigid to render growth impossible.

A biological analysis of pellagra-producing diets.—III, The values of some seed proteins for maintenance, E. V. McCOLLUM and NINA SIMMONDS (*Proc. Biol. Chem.*, 32 (1917), No. 3, pp. 347-368, figs. 13).—Continuing the above investigation, the authors have studied the relative value of the total protein of certain seeds by means of biological studies with rats, using a diet adequate in respect to every factor except protein, which was supplied by the seed under investigation. In one case a pure carbohydrate was added to produce a low protein mixture, in another the mixture was fed without any carbohydrate addition, and in a third the mixture was fed with a protein preparation from the seed employed so as to raise the protein level.

It was found in all cases that the vitality of the animals was greatly lowered by a diet otherwise adequate but near the physiological minimum in its protein content. From single seeds the plane of protein intake necessary for maintenance of body weight in grown or nearly grown rats when all other dietary factors were properly adjusted was found to vary from 4 to 6 per cent in the case of millet, oat, wheat, maize, rice, flax, and cotton seeds to about 11 per cent in the navy bean and pea. Millet seed and oat seed proteins appeared to be better than the other seed proteins. The nitrogen of the alfalfa leaf when fed as the sole source of protein showed no superiority over the seed proteins.

In the application of this data to the interpretation of the dietary factors operating to produce pellagra the authors call attention to the diet employed by Goldberger and Wheeler (E. S. R., 34, p. 258) for the production of experimental pellagra in which the protein consumption was not far from 8 per cent of the food mixture. This protein, derived almost wholly from seeds, is considered too low to support normal growth and close to the point where the resistant power of the adult will be decreased.

In conclusion the authors state that "there is in reality no quantity of protein, fat-soluble A, or other constituent of the diet which can be designated as the physiological minimum, without the biological values of every other dietary factor being also stated. The least amount of butter fat which will suffice to support growth when the diet is otherwise of good constitution will not be adequate in another case in which the quality of one or another factor is of a low order. This idea should be kept clearly in mind in interpreting the etiology of pellagra, in cases where several dietary factors fall below the optimum."

The dietary qualities of barley, H. STEENBOCK, HAZEL E. KENT, and E. G. GROSS (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 61-74, figs. 20; *abs. in Chem.*

Abstr. 12 (1918), No. 19, p. 2600).—The dietary qualities of barley were studied by means of feeding experiments with rats.

It was found that barley alone is unable to meet the demand of the growing animal. It is deficient in inorganic salts and in the fat-soluble vitamin but contains an abundance of the water-soluble vitamin. The protein content (13.6 per cent) proved to be too low for continued growth at the normal rate.

The authors conclude that "the primary growth determinant in barley is inorganic salts. Of secondary importance, but no less urgent, are protein and fat-soluble vitamin."

The use of soy bean as food, T. R. OSBORNE, L. R. MILLER ET AL. (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 369-387, figs. 5).—The authors have studied the nutritive possibilities of various soy bean products, using white rats as the experimental animals. Variations in the apparent nutritive value of raw and cooked soy bean meal indicate that there is nothing toxic in the raw meal, but that cooking the meal tends to make it more palatable. The different results obtained with the commercial soy bean flours are likewise attributed to unlike methods of heating in their preparation. The properly cooked soy bean was found to contain proteins adequate for promoting normal growth, an adequate supply of the water-soluble vitamin, and some of the fat-soluble vitamin. It is deficient in its mineral constituents, being relatively poor in calcium and chlorine.

The authors consider that the facts that the soy bean is the only seed hitherto investigated, with the possible exception of flax and millet, which contains both the water-soluble and fat-soluble vitamins and that its protein is of high physiological value lend a unique significance to its use as a food.

The value of the yeast vitamin fraction as a supplement to a rice diet, A. D. EMERY and L. H. McKIM (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 409-419, figs. 4).—This is a report of the first of a series of investigations dealing with the efficiency of the vitamins from autolyzed brewers' yeast as adjuncts to a diet that has been shown to be deficient in some particular vitamin. Pigeons were fed on polished rice until polyneuritis developed. They were then treated with the Seidell autolyzed yeast vitamin and after recovery were fed a diet consisting of one of the following: Polished rice with vitamin, shelled corn, brown or natural rice, brown rice with vitamin, barley, unhulled oats, and hulled oats.

A study of the different reagents used to adsorb the vitamin fraction from autolyzed yeast led to the conclusion that ordinary fullers' earth ground to a definite fineness is as satisfactory as Lloyd's reagent, but that the Kieselguhr does not adsorb the yeast vitamin. The effect of the dietary treatments and the authors' conclusions are summarized as follows:

"The activated fullers' earth when given as a rational supplement to a polished or a brown rice diet acts as a partial stimulant to increase the weight of the treated polyneuritic pigeons. It does not, however, in the case of the polished rice, accelerate the increase in weight to anything like that which is produced under similar conditions with brown rice alone, corn, barley, or hulled oats, and, comparatively speaking, this activated yeast vitamin is not a complete supplement to a polished rice diet.

"There are apparently two so-called vitamins associated with rice polishing, one which cures polyneuritis and one which produces weight, and of these two, the Seidell yeast vitamin preparation contains chiefly the curative fraction along with a small percentage of the other.

"Finally, it is evident that while this activated yeast vitamin product is a valuable adjunct to the diet in the case of convalescents from avian polyneuritis, yet, for the best results, the diet should, in addition, be made up in part at least of vitamin-containing foods, not for the purpose of preventing the

recurrence of typical attacks of this dietary deficiency disease (for the preparation is able to do this) but with the object of bringing about normal gains in weight and complete recovery."

Food accessory factors (vitamins) in bacterial culture, with especial reference to hemophilic bacilli, I, D. J. DAVIS (*Jour. Infect. Diseases*, 21 (1917), No. 4, pp. 392-403; *abs. in Abs. Bact.*, 2 (1918), No. 2, p. 59).—The author discusses the following characteristics of hemoglobin in relation to the growth of hemophilic bacteria: (1) Hemoglobin is essential for their growth, (2) it is sufficient in high dilution, (3) alone it will not support growth, other proteins being necessary for continued development, and (4) it does not lose its power of supporting growth through prolonged heating at the boiling point or even higher.

Attention is called to the close correspondence between these characteristics and the properties and mode of action of the food accessory factor, water-soluble B. The fact that a much greater growth of hemophilic bacteria takes place when fresh animal or plant tissue is added to the medium or another organism is allowed to grow on the same plate suggests the similarity of the tissue factor to fat-soluble A.

The author concludes that the activity of the food accessory substances in animals and in higher plants may concern, or in some way control, the metabolism of certain elements like iron, phosphorus, calcium, or iodine, as well as, possibly, the protein metabolism.

Food accessory factors (vitamins) in bacterial culture, II, D. J. DAVIS (*Jour. Infect. Diseases*, 23 (1918), No. 3, pp. 248-251).—The study noted above has been extended to include the problem of finding substances which might enhance the growth of other than hemophilic bacteria. The organisms used were *Bacillus coli*, *B. typhosus*, *B. diphtheriae*, *Streptococcus hemolyticus*, *Staphylococcus aureus*, *Blastomycetes*, *Sporotrichum schenckii*, *Streptothrix*, *B. pyocyaneus*, and *B. prodigiosus*.

It was found that these organisms are not apparently specifically stimulated to grow through the addition to ordinary media of hemoglobin or of vitamin-containing substances such as unpolished rice and wheat bran. The addition of sprouted grain to the medium caused a much more rapid growth. The author suggests as factors responsible for the growth stimulation soluble vitamins, sugars, and more soluble nitrogenous products produced in the sprouting process.

Horse flesh as human food, L. PRICE (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 5, pp. 679-692).—This article includes an historical outline of the use of horse flesh as a human food; a description of the dressed carcass of the horse, with a summary of analytical data as to its composition; a discussion of meat inspection, including the pathological conditions met with in the slaughtering of horses; a criticism of arguments advanced in opposition to the use of horse flesh as food; a description of the restrictions and means of control of the sale of horse meat; and tests for its detection.

The casein of human milk, A. W. BOSWORTH and LOUISE A. GIBLIN (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 115-117; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1971, 1972).—Casein isolated from human milk was found to contain 5.31 per cent moisture and to give the following results on analysis calculated to the dry basis: Nitrogen 15.75 per cent, phosphorus 0.7, and sulphur 0.7. These results correspond closely to those of goat's and cow's milk, previously noted (E. S. R., 34, p. 708). The casein also resembles that of goat's and cow's milk in valence, molecular weight, and in reactions with bases and with rennin.

The metabolism of the mustard oils, W. H. PETERSON (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 583-600, *figs. 4*; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657).—

Metabolism experiments with pigs for the purpose of throwing some light on the chemical changes the mustard oils undergo in the body are reported.

Evidence is given of a very slow metabolism of the oils and of the inability of the body to dispose of these oils readily. Although not oxidized in their passage through the animal, they are not eliminated unchanged, as there is little or no mustard oil in the urine. It is possible that they are converted into some nonvolatile, less toxic substance. The fact that there is no particular increase in the volatile or total sulphur in the feces shows that the oils are absorbed from the digestive tract. From 40 to 70 per cent of the oil appears to be excreted in the urine, the remainder probably being eliminated through the lungs and skin.

Amylase and protease action of some pancreas preparations. H. C. SHERMAN and DORA E. NEUN (*Proc. Soc. Expt. Biol. and Med.*, 15 (1918), No. 4, p. 55).—The authors have shown that purified preparations of pancreatic amylase always exhibit a marked proteolytic activity, whether tested by the determination of total and of amino nitrogen, by determination of the acidity of digestion, or by the increase of electrical conductivity.

Action of pancreatic enzymes upon casein. H. C. SHERMAN and DORA E. NEUN (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 7, pp. 1138-1145; *abs. in Chem. Abs.*, 12 (1918), No. 17, p. 1786).—Continuing the investigations noted above, the authors report a comparative study of the hydrolysis of casein by various preparations derived from the pancreas. Analytical data are given of the proteolytic activities of high-grade commercial pancreatins, of the three principal fractions recovered from the pancreatin in making from it the pancreatic amylase preparations, and of the most active trypsin commercially available. The following results were obtained:

"Extraction of the pancreatin, with 50 per cent alcohol, leaves a residue having about the same proteolytic activity as the original pancreatin. The sac precipitate obtained during dialysis in 50 per cent alcohol in the course of purification of pancreatic amylase had 15 times the proteolytic activity of the original high-grade pancreatin and about 4 times that of the most active commercial trypsin which we have seen. The final preparation of pancreatic amylase purified as described in previous papers from this laboratory has proteolytic activity fully equal to that of the high-grade trypsin when tested by any of the five methods used for the measurement of proteolytic power."

[Analysis of a so-called egg substitute], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 87-89).—An analysis of the product called "Sa-ran-eg," a so-called egg substitute, showed it to be composed mainly of yellow corn meal, with some milk powder and a little baking soda.

[Miscellaneous food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 75-99).—In addition to several articles abstracted elsewhere in this issue, this number contains an article by F. W. Christensen, entitled "Shall We Eat Whole-wheat Bread?" an analysis of a proprietary drug preparation, and data as to the composition of various foods and beverages analyzed.

Coriaria myrtifolia as an adulterant of marjoram. G. M. BERINGER (*Amer. Jour. Pharm.*, 90 (1918), No. 8, pp. 555-565, figs. 11).—Various methods employed in the detection of *C. myrtifolia* as an adulterant of marjoram are discussed, and a microscopical study is reported of the structure of marjoram and of authentic samples of the leaves of *C. myrtifolia*.

Food Surveys (U. S. Dept. Agr., *Food Surveys*, 1 (1918), Nos. 12, pp. 16, figs. 21; 13, pp. 16, figs. 19; 14, pp. 16, figs. 24, 2 (1918), No. 1, pp. 8).—The first of these four numbers presents data as to the commercial stocks of beans, peas,

grain sorghums, rice, and buckwheat on hand in the United States January 1, 1918. The second reports similar data as to apples and vegetables; the third as to dried fruits, nuts, and peanuts; and the fourth as to grain, flour, and miscellaneous products in the United States on July 1, 1918, including cold-storage reports.

A plan of rectal feeding, E. E. CORNWALL (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 20, p. 1451).—The principles of rectal feeding are discussed and two prescriptions given.

Studies of the gastric residuum.—II, Total phosphorus, C. C. FOWLER (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 389-393).—In continuation of previous work (E. S. R., 36, p. 562), determinations were made of the phosphorus content of 52 samples of gastric residuums from healthy women.

It was found that the total phosphorus seems to bear no relation to total acid, free acid, pepsin, or volume. The phosphorus content calculated as P_2O_5 varied from 6.48 to 30.03 mg. per 100 cc. About 58 per cent of the samples fell within the range P_2O_5 equivalent to from 12 to 18 mg., while 21 per cent lay above and 21 per cent below these values. A tendency toward a constant P_2O_5 content was shown in individuals who were examined more than once. In a previous investigation made upon a composite residuum sample obtained from 70 men a value of 12.16 mg. of P_2O_5 per 100 cc. of residuum was obtained as against the average P_2O_5 content of 15.66 mg. In this series of determinations on women.

Note on the carbon dioxid content of urine, W. DENIS and A. S. MINOR (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 569-575).—The results of a limited number of observations reported in this paper indicate that the total carbon dioxid in the 24-hour urine from a normal subject taking the ordinary mixed diet may vary from 20 to 211 cc., depending upon the combinations of acid and base foods chosen by the individual. Attention is called to the probable importance of bicarbonate in determining the reactions of neutral and amphoteric human urines.

A study of amino nitrogen and glucose in lymph and blood before and after the injection of nutrient solutions in the intestine, E. M. HENDRIX and J. E. SWEET (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 299-307).—Amino nitrogen determinations were made on blood and lymph collected before and after the injection into the small intestine of protein and amino acid solutions, and the results were compared with those obtained when sugar was injected and the glucose content of the blood and lymph determined. Dogs which had fasted about 18 hours were used in the experiments. The results of the investigation are summarized as follows:

"Less amino nitrogen is found in the thoracic lymph than in the blood of a fasting dog. After the injection of milk, 'peptone,' or amino acid solutions into the intestine the amino nitrogen in both the systemic blood and lymph increases, but the amount in the lymph is greater than in the blood. Ginsberg's findings, that the introduction of sugar solutions into the intestine increases the amount of glucose in the lymph, are confirmed. The old observation that the amount of glucose in the lymph is greater than in the blood has also been confirmed. The amount of sugar in the blood of the mesenteric veins and the lymph after the introduction of sugar into the intestine seems to be practically the same.

"It is suggested that the practically complete absorption of protein and carbohydrate by the blood is not due to a selective resorption, but to the almost infinitely large volume of blood, as compared to the volume of lymph, which flows through the walls of the intestine."

Relationship between cholesterol and cholesterol esters in the blood during fat absorption. A. KNUDSON (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 337-346).—Determinations of the balance between cholesterol and cholesterol esters and determinations of total fat and lecithin in the whole blood and in blood plasma were made on dogs during a series of fat absorption experiments with the following results:

The quantity of cholesterol showed no constant change, agreeing with results reported by Bloor (*E. S. R.*, 35, p. 166). The cholesterol esters, total fatty acids, and lecithin increased in plasma and corpuscles, but to a greater extent in the corpuscles. A fairly constant relationship between total fatty acids and cholesterol esters and between lecithin and cholesterol esters was noted in the whole blood.

The author concludes that the greater increase of cholesterol esters and lecithin in the blood corpuscles, along with the greater amount of fatty acids, would indicate that the blood corpuscles play a very active part in fat metabolism.

The rate of dialysis of the blood sugar in experimental diabetes. I. S. KLEINER (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 471-487, figs. 6; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1663).—The author discusses the dialysis methods that have been used to determine whether the sugar in blood is free or combined, and describes his own experiments, differing from those of others in using the blood of diabetic as well as of normal animals, and in determining the sugar content at frequent intervals instead of at the beginning and end of the dialyzing periods.

The experimental data seem to show that sugar does not dialyze from diabetic blood in the same manner as glucose which has been added to normal blood. There is a definite retardation and sometimes a complete cessation of dialysis at certain periods in the case of the diabetic as compared with the control. This is particularly marked during the second hour, when the dialysis of the diabetic blood sugar may cease entirely.

Hypotheses suggested to explain this difference in behavior are that the retardation may be due (1) to a clogging of the membrane by fat or lipoids present in the blood, (2) to a formation of sugar while the dialysis continues, or (3) to part of the blood sugar being in a combined state. The last hypothesis is considered by the author to be the most plausible, and its significance in furnishing a possible explanation of diabetes is discussed.

The alkali reserve in the blood of pellagrins. J. W. JORLING and E. S. MAXWELL (*Jour. Amer. Med. Assoc.*, 69 (1917), No. 24, pp. 2026, 2027).—Data obtained in the study of the alkali reserve in the blood of pellagrins show that "the alkali reserve of the blood in pellagra does not vary from normal in either the acute or the chronic cases, therefore there is no acidosis or alkalosis in pellagra. The viscosity of the blood shows a slight variation from normal."

ANIMAL PRODUCTION.

Genetics in relation to agriculture. E. B. BABCOCK and R. E. CLAUSEN (*New York: McGraw-Hill Book Co., Inc.*, 1918, pp. XX+675, pls. 4, figs. 239).—The first 14 chapters of this textbook consist of a fundamental treatment of the facts and principles of genetics under the topics of methods and scope of genetics, variation, physical basis of heredity, independent Mendelian inheritance, linkage, factors, allelomorphs, inheritance of sex and related phenomena, species hybridization, pure lines, and mutations. In the second part, which is devoted to plant breeding, the purpose has been to set forth in a practical manner the progress

that genetics has made in furnishing a rational explanation for the phenomena of variation and heredity, and in guiding the breeder so that he may reach his goal with greater speed and economy. Part 3, on animal breeding, does not claim to be a complete manual on the subject. In this part of the text the authors merely endeavor to point out a few fundamental relations existing between genetics as a pure science and animal breeding, the craft or art of improving animals and maintaining present standards of excellence.

The book closes with a glossary of technical terms used, an extensive list of literature cited, and an author and subject index.

The effect of omnivorous and vegetarian diets on reproduction in the albino rat, J. R. SLONAKER and T. A. CARD (*Science*, n. ser., 47 (1918), No. 1209, pp. 223, 224).—In this experiment, now in its fifth year, the number of pairs of rats constantly under observation was 40. About 20 of these pairs were restricted to a vegetable diet, and the remainder were given the vegetables with some form of animal food added. As soon as one of a pair died the other was remated, or when they were too old to breed they were discarded and the cages restocked.

Some of the results secured are given in the following table:

Effect of diet on reproduction in rats.

Kind of diet.	Average number of litters per breeding pair.	Proportion of non-breeding pairs.	Total average number of litters.	Greatest number of litters.	Greatest number born from single pair.	Average number born per pair.	Average number in litters.	Average weight at birth.	Average weight at 30 days.	Average weight at 100 days.	Ratio of sexes of young.
Omnivorous.....	3.7	12	3.15	1	41	15	4.8	4.29	28.8	208	111.7:100?
Vegetarian.....	1.9	16	.89	3	23	4	4.5	4.00	15.7	149	107.7:100?

Matings were made to test which sex was the cause of the failure to reproduce. Vegetarian pairs, when they ceased to reproduce, were separated. New, healthy omnivorous males were mated to the vegetarian females, and new, healthy omnivorous females were mated to the vegetarian males. All these new matings failed to reproduce. The conclusion drawn is that a vegetarian diet produces sterility in both sexes and tends to exterminate the race.

Composition and digestibility of Sudan-grass hay, W. G. GAESSLER and A. C. McCANDLISH (*Jour. Agr. Research* [U. S.], 14 (1918), No. 4, pp. 176-186).—A résumé of previous work on Sudan-grass hay by a number of experiment stations and the U. S. Department of Agriculture is given, and the results of a study made at the Iowa Station on the composition and digestibility of the hay are reported in tabular form and discussed. Analyses made of the crop in 1915 at various stages of growth gave the following results:

Composition of dry matter of Sudan grass at various stages of growth.

Stage of growth.	Before heading.	Headed out.	Full bloom.	Half ripe.	Ripe.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Total dry matter.....	20.80	20.95	25.74	50.03	31.42
Protein.....	8.80	9.73	6.57	3.02	4.24
Nitrogen-free extract.....	48.12	46.04	50.19	53.32	53.71
Crude fiber.....	32.88	35.59	32.35	32.93	33.83
Ether extract.....	2.31	2.62	3.53	2.10	1.63
Ash.....	7.79	6.06	7.35	6.53	6.43

It is pointed out that the dry matter of Sudan grass changes slightly in composition from the time of heading until mature. The content of fat and protein was found to increase in the early stages of ripening and to decrease later, while the changes in the nitrogen-free extract and ash content were in the opposite direction. The relative proportion of crude fiber in the dry matter was greater apparently when the plants had headed out than when they were ripe.

A digestion trial was conducted with two heifers for five days, preceded by a preliminary period of seven days, during which only Sudan-grass hay was fed. The average coefficients of digestibility determined were as follows: Dry matter, 64.9 per cent; protein 47.4; nitrogen-free extract, 67.8; crude fiber, 70.6; and ether extract 58.4. From these results it is concluded that the nutrients of Sudan-grass hay are all fairly easily digested, and that it supplies energy to cattle much more efficiently than it does protein. Its net energy value is computed as 64.42 therms.

Shorthorn cattle, A. H. SANDERS (*Chicago: Sanders Publishing Co., 1918 [ed. ed.]*, pp. 1021, pls. 116, figs. 3).—In this edition of this treatise (*E. S. R.*, 35, p. 109) is appended the story of the Shorthorn in America through the opening years of the present century, by B. O. Cowan, under the direction of the author.

Cooperative soft pork investigations (*Texas Sta. Bul.* 216 (1918), pp. 3-18, figs. 5).—This bulletin is divided into four parts, each dealing with a particular line of work bearing on the firmness of pork.

I. A method for the testing of pork on the basis of firmness, by P. V. Ewing, R. M. Green, and L. B. Burk (pp. 5-7).—A description is given of a newly devised laboratory method by means of which a figure expressing the firmness of the sample of pork tested is obtained. The method consists in the employment of a modification of the Vicat apparatus, generally used in determining the consistency of Portland cement paste, and which is based on the application of a 500-gm. weight on a 1-cm. right cylindrical plunger. In addition, a multiplier dial is used to measure the indentation to 0.1 mm. The samples to be tested are preserved at ordinary refrigerator temperature, and their surfaces are kept fresh for testing. The retention of the natural position of the connective tissue is imperative and necessitates the preparation of the sample at as low a temperature as possible. Uniformity in the preparation of samples is also a prime requisite.

"For making the test about 1 lb. from the ham end of the back fat is required. This is placed in a 3-oz. cylindrical tin dish, 6-cm. in diameter with vertical sides approximately 4.5-cm. in height, so that the pressure is applied perpendicularly to the median line cut. The tests are made on the inner stratum of the back fat and not on the skin stratum, which contains more connective tissue and shows a firmer test. The pieces are placed on edge in the center of the can and packed with sized pieces so as to fill all air spaces as far as possible. To fill completely these spaces, cool but melted lard from the sample is poured in the voids, after which the sample is placed in the refrigerator until ready for testing.

"The temperature for testing is 0° C. . . . Before making the test the needle is thoroughly chilled in the brine solution. The end of the needle is then brought in contact with the surface of the fat and a reading of the instrument taken. The plunger is then released, and allowed to rest upon the surface of the meat for five seconds, when it is again set, and another reading taken. The difference between the two readings is a measure of the degree of firmness. This difference is expressed as points, each point representing an indentation of 0.1 mm."

II. *A tentative standard for testing pork on the basis of firmness*, by P. V. Ewing, L. B. Burk, and R. M. Gren (pp. 7-11).—A committee representing swine breeders, packers, and commission men met for the purpose of establishing a standard line for grading pork on the basis of firmness. The tests to establish this line were made by the station according to the method described above. The numerical expressions denoting the degree of firmness are given in a table. The line giving approximately the same number of errors in soft and hard samples, and which was found to be located between 10 and 11, was taken as the tentative standard, subject to revision. It is considered that pork testing under 11 at 0° can be regarded as hard, while that testing 11 or above is soft.

III. *Ante mortem grading of pork on basis of firmness*, by P. V. Ewing and L. B. Burk (pp. 11-14).—Steps were taken to devise a workable method for the determination in the live hog of the firmness of the pork after killing, but all results obtained seemed to indicate that "there is no detectible correlation between the firmness of the live hog and the firmness of the carcass he will produce." It was likewise found quite evident that no relationship exists between the ante mortem temperature of the hog and the firmness of the pork when chilled.

IV. *Method of extracting fat samples from live hogs*, by P. V. Ewing, L. H. Wright, and L. B. Burk (pp. 15-18).—A method of extracting small samples of fat from live hogs to determine at any time during the feeding period the probable quality of pork that would be produced on slaughter was developed and a description of it is given.

It was found that samples of 0.05-gm. were amply large. After testing two general methods and several devices, it was found that the use of a borer, consisting of a twisted clock spring fitting inside of a trocar canula and sharpened on the end like a bit, proved entirely satisfactory for the extraction of fat samples.

The operating area, located on the loin, 6 in. in diameter and centered 3 in. to the right of the median line and 3 in. back of the last rib, is clipped, washed with brush, soap, and hot water, and treated with iodine. The sterilized trocar is then inserted and the sample removed in as aseptic a manner as practical. After this the canula is withdrawn, and sometimes the temperature of the area is taken 0.5 in. below the surface of the skin. The opening is then filled with a 5 per cent solution of iodine in alcohol, sealed over with collodion, and treated with a mixture of tar, turpentine, and linseed oil to protect against flies and to aid in healing.

No very injurious or painful effects were observed in over 100 operations. These were in most cases bloodless, and the extracted fats were clear and white.

Influence of peanut meal on quality of pork, L. B. Burk (*Texas Sta. Bul.* 228 (1918), pp. 3-18, figs. 8).—The experiments here described were conducted in 1917 along the same general lines as the work carried on in 1916 and previously reported (*E. S. R.*, 37, p. 367), with the exception that rice bran and rice polish were added to the feeds compared. Six lots, each of 10 pure-bred Duroc-Jersey hogs, for 75 days were fed rations proportioned as follows: Lot 1, milo maize chop and cottonseed meal (6:1); lot 2, rice bran, rice polish, and cottonseed meal (4:4:1); lot 3, milo maize chop and peanut meal (7:1); lot 4, milo maize chop and peanut meal (1:1); lot 5, milo maize chop and ground whole-pressed peanuts (5:2); and lot 6 for the first 22 days was fed on peanut meal alone and for the remaining 53 days of the experiment on milo maize chop and peanut meal (2:1). During the first two weeks the hogs were brought up to full feed, and after this they were fed twice a day all they would eat.

The average daily gains per head from the different rations were as follows: Milo maize chop and peanut meal (7:1), 1.64 lbs.; milo maize chop and ground whole-pressed peanuts (5:2), 1.53; milo maize chop and cottonseed meal (6:1), 1.52; milo maize chop and peanut meal (2:1), 1.31; and milo maize chop and peanut meal (1:1), 1.3. Lot 6 on peanut meal alone made an average daily gain per head of 0.54 lbs., and when fed on milo maize chop and peanut meal (2:1), 1.64 lbs.

Lot 3 fed a ration of milo maize chop and peanut meal (7:1) thus produced the largest daily gain, and required practically the same amount of feed per 100 lbs. of gain as did lot 4 on a ration composed of equal parts of the chop and the meal. Cottonseed meal and ground whole-pressed peanuts gave practically identical results when fed with milo maize. Rice bran and rice polish produced the smallest total and average daily gain, and required the largest amount of feed per 100 lbs. of gain, but this was produced at the lowest cost.

After slaughtering, the pork of lot 1 and lot 3 was graded as firm, and that of the other lots as soft.

The utilization of phytin phosphorus by the pig. J. B. RATHER (*Arkansas Sta. Bul. 147* (1918), pp. 3-26).—The experiments here reported were undertaken for the purpose of studying the ability of pigs to utilize the phytin phosphorus that has been found to form such a large part of the phosphorus of such feeds as corn, cottonseed meal, wheat shorts, Kafir corn, wheat bran, oats, rice bran, and rice polish (*E. S. R.*, 39, p. 14).

Two 100-lb. pigs were fed for 16 days in digestion crates on the rations to be tested, and the excreta were collected and analyzed during the last eight days of the period.

As methods for the determination of phytin phosphorus in plant products proved unsuitable for feces a study was made of the nature of the principal phosphorus compounds in feces. When feeds were used in which the phosphorus was principally in the form of phytin, the principal if not the only acid-soluble phosphorus compound of the feces was orthophosphoric acid. For the determination of inorganic phosphorus in pig feces a modification of the Hart and Andrews method (*E. S. R.*, 15, p. 496) gave satisfactory results. The soluble phosphorus of feces from corn, cottonseed meal, wheat shorts, Kafir corn, wheat bran, and rice polish was almost entirely inorganic in nature, and the inorganic phosphorus varied from 75 to 100 per cent of the total phosphorus of the feces. The amount of ether-soluble phosphorus was in most cases extremely small. The phosphorus compounds of the urine from these feeds appeared to be largely inorganic in nature. Fractionation of the soluble phosphorus of feces from a pig fed on wheat shorts, which had been heated to destroy phytin-splitting enzymes which might be present, failed to reveal any forms of phosphorus other than inorganic. The phosphorus eliminated in the feces from this feed treated in the manner indicated was almost entirely inorganic in nature, and differed in no way in this respect from the phosphorus in the feces from unheated wheat shorts. Feces from a pig fed on the enzyme-free feed had the power to split sodium phytate *in vitro*.

The minimum extent to which phytin phosphorus was taken up by the pigs used in these experiments ranged from 21 to 73 per cent in the case of the several feeds tested. It is concluded that the pig has the power to split phytin completely when it is fed in its natural state, and that the enzymes of the feed are not necessary to accomplish this result.

Eliminate the slacker hen. V. G. AVERY (*New Jersey Sta. Hints to Poultrymen*, 6 (1918), No. 19, pp. 4).—An outline is given for separating good from poor hens by means of external appearances.

General regulations governing licenses operating stockyards, or handling or dealing in live stock in or in connection with stockyards (*U. S. Dept. Agr., Off. Sec. Cir. 116 (1918), pp. 14*).—The text is given of the President's proclamation of June 18, 1918, requiring the licensing of stockyards and commission men dealing in live stock in connection therewith, and of the regulations governing the licensees.

DAIRY FARMING—DAIRYING.

Respiration apparatus, its meaning and use in experiments with dairy animals (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen], 94 (1917), pp. 5-174, pls. 5, figs. 12*).—This report contains a discussion of the meaning of respiration experiments in the study of the feeding of milch cows, by H. Möllgaard; a description of the Pettenkofer respiration calorimeter and the general principles of the technique used in metabolism experiments with milch cows, by H. Möllgaard and A. C. Andersen; a preliminary account of respiration experiments with milch cows, by H. Möllgaard; and a discussion of protein substances and some newer methods for the study of their composition, by A. C. Andersen.

Coconut meal v. cottonseed meal for dairy cows, P. V. EWING and E. R. SPENCE (*Texas Sta. Bul. 225 (1918), pp. 3-9*).—The results of experiments made to compare the relative feeding values for dairy cows of coconut meal and cottonseed meal are reported. Two lots of five cows each were fed 25 lbs. of silage per head per day and a variable quantity of roughage, together with a quantity of concentrate made up of wheat bran and peanut meal 3:2. In addition to this basal ration the cows were fed as a supplemental concentrate either coconut meal, cottonseed meal, or a mixture of equal parts of the two. The experiment was conducted on a 7-day basis and was continued for 16 weeks. An individual feeding schedule based on production was followed for each cow. An analysis of the coconut meal fed is included.

It was found that for the coconut meal, cottonseed meal, and mixed rations the feed cost per pound of milk was 2.22 cts., 2.23 cts., and 2.11 cts., respectively, and per pound of milk fat 36.4 cts., 27.5 cts., and 36 cts., respectively. The gain or loss in body weight during the experiment was negligible.

It is believed that while some coconut meal can be added profitably to dairy rations to replace a part of the cottonseed meal this substitution, owing to the tendency of the coconut meal to turn rancid, is limited probably to about 2 lbs. per head per day.

The place of dairying in southern agriculture, T. BUTLER (*Prog. Farmer, 33 (1918), No. 16, pp. 512, 513*).—The importance of dairying in the upbuilding of soil fertility on the average southern farm and the place that dairying should occupy under southern farm practice are outlined.

The milk question in New England, R. W. BISA, P. R. ALLEN, J. C. RUNKLE ET AL. (*Boston: Chamber Com., 1917, pp. 57*).—A report upon conditions surrounding the production of milk in New England and its distribution in Boston during 1917. This investigation supplements the one previously noted (*E. S. R., 34, p. 380*), and endeavors to ascertain the solution of some of the difficulties confronting the dairy industry. The survey involved over 850 herds, aggregating 15,000 cows, on farms in New England producing market milk.

The following table gives cost per quart at the railroad station and production per cow by States of the herds involved in this survey:

Estimated cost of milk production per quart by States in New England.

State.	1916 to May, 1917.	Septem- ber, 1917.	Decem- ber, 1917.	Average produc- tion per cow.	
				This survey.	Whole State, 1916.
Maine.....	Cents, 5.62	Cents, 6.30	Cents, 6.62	Pounds, 5,749	Poun's, 5,823
New Hampshire.....	4.03	5.35	5.67	5,911	5,738
Vermont.....	4.90	5.62	5.91	5,437	4,982
Massachusetts.....	6.47	7.46	7.69	5,005	4,727
Connecticut.....	5.53	6.71	6.82	6,009	4,188

Tables are given in the report summarizing the cost of producing milk by States on December 31, 1917. In these tables the attempt is made to standardize the quantity of feed, labor, etc., used in producing a definite amount of milk, so that the cost of production may be brought up to date by substituting new values. The cost of getting milk to Boston, including station and can expenses and freight, based on the 220 to 240 mile zone as an average, was 1.44 cts. per quart.

An investigation was also made of the factors and costs concerned in the distribution of milk in Boston. It is noted that about 30 per cent of the entire milk sold in the city is delivered to the household trade, about 25 per cent to the dealers to be sold again in bottles, and about 35 per cent to the wholesale trade in cans. The balance of approximately 10 per cent is converted into surplus product or allows for shrinkage and waste. The average cost per quart for the distribution of milk by the larger milk dealers for the fiscal year ended March 31, 1917, based on an average selling price of 10.421 cts. per quart, was as follows: Price to farmers, 4.288 cts.; waste, 0.21 ct.; country expenses, 0.101 ct.; freight, 0.628 ct.; manufacturing expenses, 1.163 cts.; delivery, 2.226 cts.; administrative expenses, 0.191 ct.; and profit, 0.311 ct. Similar data for October, 1917, based on a selling price of 14 cts. per quart, were as follows: Price to farmers, 6.976 cts.; waste, 0.233 ct.; country expenses, 0.121 ct.; freight, 0.628 ct.; manufacturing expenses, 1.25 cts.; delivery, 3.388 cts.; administrative expenses, 0.468 ct.; and profit, 0.5 ct. The average cost of distribution per quart of milk in Boston and vicinity by small dealers during the fiscal year ended March 31, 1917, was, for plant costs, 0.928 ct.; delivery, 1.211 cts.; overhead, 0.491 ct.; and total, 2.633 cts. The actual costs to these dealers varied from 1.9 to 4.5 cts. per quart.

Report of the Governors' Tri-State Milk Commission (*Penn. Dept. Agr. Bul. 257 (1917), pp. 70, pls. 19*).—The Governors' Tri-State Milk Commission was formed by the joint organization of commissions appointed by the Governors of Delaware, Maryland, and Pennsylvania, respectively, for the study of problems confronting the production and marketing of milk in these three States, with special reference to the milk supply of Baltimore, Philadelphia, and Wilmington. This report of the joint commission gives the results of public hearings bearing for the most part upon the cost of producing milk in 1916, distribution of milk, surplus milk supply, grading milk, and the food value of milk in its relation to price.

Profitable dairy herds through cow testing, A. C. RAGSDALE (*Univ. Missouri, Agr. Ext. Serv. Circ. 43 (1918), pp. 20, figs. 10*).—In addition to general notes on cow testing associations, a study is reported of the results obtained in the Jackson County cow testing association during the three years of its existence.

In this association 28 cows were sold as unprofitable the first year, 39 the second year, and 50 the third year. The average milk production per cow was 5,407 lbs. the first year, 5,984.3 the second year, and 6,223.8 the third year. During this time the averages of the fat production were 254.6, 274.5, and 288.7 lbs., respectively. During the third year the average feed cost per cow for the 10 most profitable cows in the association was \$72.07, and their average fat production, 453.9 lbs. These cows returned \$3.39 for each dollar invested in feed. The 10 least profitable cows had an average feed cost of \$66.11, and produced 181.6 lbs. of fat per cow. They returned \$1.46 for each dollar invested in feed.

The main factors tending to produce poor or good cows are outlined from a study of each individual of these 20 low and high producers. The effect of good sires in the development of high-producing dairy herds is seen in the fact that several of the highest-producing herds in this association are made up largely of descendants from two bulls.

A new plan for cow testing (*Canada Dept. Agr., Dairy and Cold Storage Branch Circ. 24 (1917), pp. 7, figs. 2*).—The plan described proposes to abolish the dairy record centers and to enlist the services of cheese makers and butter makers or other qualified testers to do the testing for each group of cooperating farmers. The farmers are to weigh and sample each cow's milk night and morning for three days every month and deliver the samples to the appointed place for testing. The records of weights and tests are to be sent to the department of agriculture at Ottawa, which agrees to employ a supervisor for each Province, pay 10 cts. per test for all Babcock tests recorded and sent in, make the necessary calculations, and supply blanks, preservative tablets for samples, and sulphuric acid for testing.

The story of three cows, W. W. Swerr (*Hoard's Dairyman*, 55 (1918), No. 13, pp. 551, 566, 567, 582, figs. 3).—An account of how the Holstein portion of the dairy herd of the University of Missouri has been built up from a few foundation animals.

In 1902 \$600 was paid for four bred heifers, since when no females have been purchased. Only three bulls have been used that were not raised on the university farm. In the meantime surplus and breeding stock has been sold for \$11,073, and the present herd numbers 38 females, valued at approximately \$16,000. In the 15 years the three of the four original cows that were retained and their off-spring produced 1,561,408 lbs. of milk, containing 50,078 lbs. of fat. Notes are given on the selection of sires for use in the improvement of dairy herds.

Some aspects of the physiology* of mammary secretion, R. L. Hull (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 5, pp. 642-654).—The experiments here reported were made for the purpose of studying the effect of pituitary extract injection on the quality and quantity of milk secreted, its mode of action, and the effect of its repeated injection upon the animal.

An Angora goat injected with 2 cc. of pituitrin just prior to the evening milking on three alternate evenings gave an average of 9.4 gm. of fat for the three evening milkings, while the average of the four normal evening milkings was 1.34 gm. The amount of milk secreted was also greatly increased following the injections. This increase in milk and fat secretion was followed by a decrease below normal at the next milking period. The total daily secretion of milk was only slightly altered by the injection of pituitary extract.

Complete analyses of 75 samples of milk from three goats indicate that the fat alone was materially affected by the injection.

Injections of pituitrin at 2-hour intervals gave an increase of milk and fat secretion in goats only after the first injection. Repeated injections over a prolonged period resulted in an apparent tolerance. However, this tolerance for pituitrin had entirely disappeared at the succeeding lactation period.

The results of the author's researches support the theory that the action of the pituitrin is glandular rather than muscular in nature, the secretory epithelium lining the alveoli being stimulated by its use, resulting in milk secretion.

The cow's udder and process of milk production, M. H. REYNOLDS (*Hoar's Dairyman*, 55 (1918), No. 13, pp. 552, 553, figs. 9).—A brief outline is given of the physiological factors underlying and affecting milk secretion.

Cooling milk and cream on the farm, J. A. GAMMEL (*U. S. Dept. Agr., Farmers' Bul.*, 976 (1918), pp. 16, figs. 8).—This is a general treatise on the principle of cooling, effect of temperature upon the development of bacteria in milk, the use of surface coolers and milk cooling tanks and of ice and well or spring water for cooling milk, keeping milk cool during shipment, the storage of milk pails, and the cooling of cream.

Acidity and butter, II, F. W. BOVSKA (*N. Y. Produce Rev. and Amer. Cream.*, 35 (1918), No. 22, pp. 814-816).—In this second article on the relation of cream acidity to butter quality and the neutralization of cream (*U. S. R.*, 38, p. 251) the technique of cream neutralization is described and means to determine the amount of lime to use are set forth. It is noted that 93114 lb. of quicklime or 2,07426 lbs. of 15 per cent lime-water should reduce the acidity of 1 per cent in 1,000 lbs. of cream. A table is given showing how much lime-water is needed to reduce the acidity of different creams to 0.3 per cent. The effect of neutralizing cream on health is discussed.

VETERINARY MEDICINE.

Infection and resistance, II, ZINSSER (*New York: The Macmillan Co.*, 1918, 2, ed. rev., pp. XIII+585, figs. 44).—This is a revised edition of the book previously noted (*U. S. R.*, 32, p. 270). The chapters on amphyphiles have been rewritten, the material on the Abderhalden reaction has been revised, and the more recent work on enzymes added. The development of conceptions of non-specific serum and cellular reactions have been discussed, and a section on immunity in syphilis has been added. The volume also contains a chapter on Colloids and Colloidal Reactions, by S. W. Young.

The eleventh annual report of the State veterinarian of Alabama, 1917, C. A. CHRY (*Ann. Rpt. State Vet. Ala.*, 11 (1917), pp. 46, figs. 6).—This report, dealing with the occurrence of and control work with the more important infectious diseases of live stock, includes accounts of tick eradication work and tuberculin testing.

Second biennial report, State Live Stock Sanitary Board of Kentucky, 1916-17, M. S. CONNOR ET AL. (*Bienn. Rpt. State Live Stock Sanit. Bd. Ky.*, 2 (1916-17), pp. 161).—This report deals with the occurrence of and work with infectious diseases of the years 1916 and 1917, including accounts of bovine tuberculosis, hemorrhagic septicemia, scabies, blackleg, Texas fever, etc.

Report on operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1916, H. MARTEL (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine*, 1916, pp. 179, figs. 21).—This is the usual report (*U. S. R.*, 37, p. 780), with statistical data on the operations of the year.

Epizootic lymphangitis and bovine tuberculosis control in Hawaii, V. A. NORGAARD (*Hawaii. Forester and Agr.*, 15 (1918), No. 4, pp. 93-100).—An outbreak of epizootic lymphangitis which took place in the Hamakua district of Hawaii is reported upon and control work with bovine tuberculosis described.

Diagnosis of pregnancy in cows, C. LÓPEZ (*Rev. Hig. y Sanidad Pecuaria* [Spain], 7 (1917-18), No. 9-12, pp. 537-550, figs. 6).—This is a general discussion of the subject, including a detailed description of the Abderhalden test.

General guaranties of preparation and distribution which veterinarians should demand from the serum and vaccine laboratories, particularly in regard to serum for hog cholera, C. LÓPEZ (*Rev. Hig. y Sanidad Pecuaria* [Spain], 7 (1917-18), No. 9-12, pp. 623-631).—The author points out the dangers arising from the use of poorly prepared vaccines and serums, and gives instructions for the management of the laboratories and for the preparation of serums and vaccines, with special precautions in regard to hog cholera serum.

Local reactions in pyotherapy, VELU (*Bul. Soc. Cent. Méd. Vét.*, 94 (1918), No. 8, pp. 179-182).—The author suggests that local reactions often accompanying the treatment of lymphangitis by pyotherapy are not due to incomplete sterilization of the pus, as suggested by Belin (*E. S. R.*, 39, p. 185), but to the presence in the pus of proteolytic enzymes which act upon the tissue.

The treatment of infected war wounds by magnesium sulphate, A. E. MONTSON (*Brit. Med. Jour.*, No. 2986 (1918), pp. 342-344).—During the past year the author has successfully used, in place of the concentrated solution of magnesium sulphate previously noted (*E. S. R.*, 37, p. 176), a paste or cream prepared by mixing 1.5 lbs. of dried magnesium sulphate with 11 oz. of glycerin and carbolic acid (10:1). The wound is packed and thickly covered with the cream, and the dressing of gauze and cotton is left unchanged for from three to eight days. In the case of deeper wounds the cream is syringed into the deeper part of the wound by means of a drainage tube. After a number of dressings and when the bacteriological findings show a marked diminution in the number and character of the organisms present, the wounds are closed.

Acriflavine and proflavine: Notes on their use in infected gunshot wounds. R. B. CARSLAW and W. TEMPLETON (*Lancet* [London], 1918, I, No. 18, pp. 634, 635).—Investigations are reported on the action of acriflavine and proflavine on infected wounds, and a discussion is given of the general action of both.

The authors state that although the action of the two salts is very similar, proflavine is slower and the improvement in general condition is not so rapid. It is considered that both flavine compounds are antiseptic rather than disinfectant in their action. They have no necrotic effect upon the tissues when used in solutions no stronger than 1:1,000. Their value in the treatment of wounds seems to be in controlling and preventing the spread of sepsis.

The treatment by brilliant green of recently inflicted gunshot wounds, R. MASSIE (*Lancet* [London], 1918, I, No. 18, p. 635).—Observations on the use of brilliant green in dressing gunshot wounds are reported. Notable features in cases treated with it are said to be the absence of edema and inflammation around the wound. It is painless in application and does not appear to interfere with the growth of epithelium.

A new disinfectant testing machine, A. M. STIMSON and M. H. NEULT (*Pub. Health Rpts.* [U. S.], 33 (1918), No. 15, pp. 529-539, figs. 3).—The authors describe a new machine used in determining the bactericidal power of disinfectants.

Studies in forage poisoning, R. GRAHAM, A. L. BRUECKNER, and R. L. FORTUS (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 161-192, figs. 35).—The data here presented have been substantially noted from another source (*E. S. R.*, 38, pp. 383, 384).

Salt poisoning in pigs and poultry, J. T. EDWARDS (*Jour. Compar. Path. and Ther.*, 31 (1918), No. 1, pp. 40-43).—The author records an outbreak of salt poisoning among pigs and poultry, together with a few experiments performed in an endeavor to establish the exact rôle of the salt in such cases.

"A series of experiments carried out in order to ascertain the minimum toxic dose was performed on pigeons. Three pigeons were injected into the full crop with solutions corresponding respectively with 0.625, 1.25, and 2.5 gm. per kilogram of body weight. Slight symptoms of depression were observed in the birds given the two higher doses for an hour or two after the injection, but otherwise no ill effects were produced. Five days later (6 p. m.) the same three pigeons were injected into the crop with increased doses of salt solution, namely, 2.5, 3.33, and 4.5 gm. per kilogram of body weight. The pigeon given the highest dose died 18 hours afterwards, and the one given the medium-sized dose 23 hours after the injection. The bird given the smallest dose showed no apparent symptoms. The other two became affected with great depression shortly after the injection, and this weakness became more and more marked until death set in. On post-mortem examination there were no lesions discoverable except acute congestion of the mucous membrane of the esophagus between the crop and the proventriculus. Chemical analysis of the crop contents of the two pigeons that succumbed disclosed the following amounts of unabsorbed sodium chlorid: Highest dose pigeon, 0.73 per cent (0.073 gm. to 10 gm. contents), medium dose pigeon, 0.76 per cent (0.0877 gm. in 11.5 gm. contents)."

Ascaris lumbricoides and coprophagia, C. LANE (*Indian Med. Gaz.*, 52 (1917), pp. 260-272; *abs. in Abs. Bart.*, 1 (1917), No. 6, p. 533).—The author concludes that there is no justification for doubting that the development of *A. lumbricoides* is direct.

Note on *Ascaris* infection in man, the pig, rat, and mouse, F. H. STEWART (*Indian Med. Gaz.*, 52 (1917), pp. 272, 273; *abs. in Abs. Bart.*, 1 (1917), No. 6, p. 533).—Six experiments conducted indicate that an intermediate host (rat or mouse) is required for the completion of the life cycle of *Ascaris lumbricoides* (in man or pig).

Some observations on abortion and its sequelae, C. C. PALMER (*Vet. Alumni Quart. [Ohio State Univ.]*, 6 (1918), No. 1, pp. 122-131).—The control of abortion is discussed under the headings of herd hygiene, sexual hygiene, management of metritis and sterility, immunity, and hygiene of sucklings.

Bibliography on abortion, W. GILTNER, G. N. POTTER, and B. B. FLOWE (*Amer. Jour. Vet. Med.*, 13 (1918), No. 7, pp. 45-52).—A bibliography of the more important literature relating to infectious abortion of live stock.

Investigations on blackleg immunization, N. NETTA (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 466-482).—This article includes a review of existing methods of immunization against blackleg, and a report of the author's investigations which are summarized as follows:

"A virulent aerobic blackleg culture, rich in spores, can be readily obtained by using meat-piece or liver-piece broth as the culture medium and it can be preserved for a year or more with the addition of glycerin. Efficacious blackleg vaccines can be made by heating the aerobic culture rich in spores, but uniform attenuation of the virus is not always expected, so that the practical use of these vaccines should be abolished, owing to possible losses from infection.

"A mixture of immune serum and virus in proper proportion confers an active immunity on animals treated. To determine its practical value, however, further experiments are necessary. An injection of the germ-free filtrate of blackleg exudate also produces an active immunity in animals treated. . . .

"The filtrate of a pure culture of the blackleg organism confers a lasting immunity on animals treated, and it has been already successfully used in thousands of cattle in infected districts. It is inexpensive, the material for the preparation being aerobic cultures of the organism in meat-piece broth, and its injection is not accompanied by the least danger because the filtrate is quite

germ-free. The filtrate can be preserved for several months with the addition of toluol."

Improved methods of immunization against symptomatic anthrax (blackleg), R. A. KELSEY (*Jour. Agr. Research* [U. S.], 14 (1918), No. 6, pp. 253-262).—The methods of preparation, potency tests, and relative values of the "germ-free vaccine" or "natural aggressin" and the toxic culture filtrate for immunization against blackleg are discussed. The procedure followed by the author, in the Bureau of Animal Industry, in the preparation of the germ-free vaccine is as follows:

Susceptible animals are inoculated intramuscularly with an emulsion prepared from the affected muscle tissue of animals dead of blackleg. The animals usually succumb to the disease in from 30 to 48 hours. The skin is then removed, and the fluid from the affected area and the affected muscle tissue are collected. The tissue is finely ground and placed with the fluid in fruit jars and frozen by means of an ice-salt mixture. The jars are then removed and inverted over funnels containing thin films of cotton and the funnels drained into a pan from which, by means of a spout, the thawed fluid is discharged into a bottle. After the dripping from the jars ceases the clots are pressed to extract more of the fluid. The product, which is filtered twice through Berkefeld filters, is preserved with 0.5 per cent chloroform.

The medium with which the author obtained best results in the preparation of a toxic culture filtrate (E. S. R., 37, p. 689) is Martin's peptone solution, to which have been added ground beef and dextrose. The inoculation is preferably made with a 24- to 48-hour culture, in dextrose, beef, or liver bouillon, of organisms recovered from a guinea pig which had been inoculated with virulent blackleg material. After incubation for 10 or 12 days the product is filtered through several thicknesses of cheesecloth, next through a thin layer of asbestos wool, and then twice through Berkefeld filters of "N" porosity. It is preserved with 0.5 per cent chloroform and stored in amber-glass bottles. Potency tests of the toxic culture filtrate show that there appears to be a direct ratio between the toxicity and potency of the product.

A type of test virus which is said to have given good results in the guinea pig tests and to possess a number of advantages over the emulsion of affected tissue has been prepared by the author as follows:

Guinea pigs are inoculated intramuscularly with an emulsion of virulent blackleg tissue and usually die in from 24 to 48 hours. Cultures are then made from the carcasses into fermentation tubes containing dextrose bouillon, which has been heated for approximately 10 minutes in the Arnold sterilizer to drive off the oxygen, and then cooled to 45° C. The tubes are incubated for 24 hours in vacuum jars at 37.5°. The pure cultures are then thoroughly mixed in a crystallizing dish with sufficient lactose to make a soft paste and dried in a vacuum desiccator containing sulphuric acid. Care should be taken to protect the material from direct light. When dry the material is removed, pulverized to a fine powder in a sterile mortar, and stored in wide-mouth amber-glass bottles at refrigerator temperature. When ready for use a definite amount of the powder is weighed out and taken up in a measured amount of distilled water.

The author considers that there is apparently a distinct difference between the immunizing principles in blackleg natural aggressin and blackleg toxic culture filtrate, and that "it is possible, therefore, that immunization with blackleg natural aggressin is brought about through the production of 'anti aggressins,' while with the toxic culture filtrate immunity is acquired through the production of antitoxin."

Concentration of symptomatic anthrax (blackleg) toxin. W. N. BERG (*Jour. Agr. Research* [U. S.], 14 (1918), No. 6, pp. 263, 264).—A preliminary report is given of some experiments made in the Bureau of Animal Industry for the purpose of devising a practical method for concentrating the blackleg toxin noted above. Attempts at precipitating the toxin with chemical agents, such as alcohol, ammonium sulphate in half and in full saturation, and zinc chloride, were unsuccessful. An application of the method of drying described by Shackell (E. S. R., 21, p. 609) was found to be successful on a laboratory scale. The details of the method are as follows:

Into each of several 9 or 15 cm. Petri dishes 10 or 25 cc. of the filtered toxin was transferred. These were kept over night in a refrigerator at -9°C . The dishes containing the frozen toxin were then transferred to Hempel desiccators containing sulphuric acid. The desiccators were evacuated with a Geryk pump to from 2 to 3 mm. of mercury and then transferred to the refrigerator at -9° where they remained for from 24 to 48 hours, or until the contents of the dishes had dried to a paste. Neutralization of the toxin with a calculated weight of acid potassium phosphate was found to produce little, if any, loss in toxicity.

The dog as a carrier of anthrax. I. SANI (*Clin. Vet. [Milan], Russ. Pol. Sanit. e Ig.*, 40 (1917), No. 11, pp. 315-321; *abs. in Vet. Rec.*, 30 (1917), No. 1518, p. 63).—The author concludes from the experiments conducted that anthrax bacilli occur in the feces of dogs fed upon anthrax flesh. Bacilli were found even 26, 28, and 32 days following the ingestion of infected flesh.

Hemorrhagic septicemia and its control in Pennsylvania. J. B. HANDEY-BERG and F. BOERNER, JR. (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 3, pp. 32-403).—Statistics obtained in vaccinating for hemorrhagic septicemia in Pennsylvania during 1915 to 1917 are presented for the purpose of showing the value of this method of controlling the disease.

In a total of 1,531 cattle in 61 herds the deaths prior to vaccination were 24, the sick prior to vaccination 43, and the healthy animals vaccinated 1,584. Of the 43 sick vaccinated, 22 deaths followed, or 51 per cent, as compared with 24 deaths of the healthy animals, or 1.5 per cent. Deaths after one week from vaccination were 16, or 1 per cent. The herds showing no deaths following vaccination were 41, or 67 per cent.

The method employed in the production of vaccine and the reasons for its use in preference to other preparations have been previously noted (E. S. R., 37, p. 179). The occurrence, etiology, anatomical changes, symptoms, and control of the disease are discussed briefly.

Leishmanioses: Kala-azar, oriental sore, American leishmaniosis. A. LAYBAN (*Leishmanioses: Kala-azar, Bouton d'Orient, Leishmaniose Américaine. Paris: Masson & Co., 1917, pp. III+522. pls. 6, figs. 40*).—This is a monograph on human visceral leishmaniosis or kala-azar due to *Leishmania donovani* (pp. 45-278), canine visceral leishmaniosis due to a species closely resembling if not a variety of *L. donovani* (pp. 279-303) cutaneous leishmaniosis or oriental sore due to *L. tropica* (pp. 304-467), and American leishmaniosis of the skin and mucous membranes due to a variety of *L. tropica* (pp. 468-515).

[Treatment of parasitic mange] (*Vet. Rec.*, 2 (1918), No. 2, pp. 177-189).—A further review of recent literature on the subject.

The lesions produced by Bacillus necrosis in domesticated animals. G. GROSSO (*Clin. Vet. [Milan], Russ. Pol. Sanit. e Ig.*, 400 (1917), Nos. 9, pp. 241-259; 10, pp. 271-289; *abs. in Abs. Bact.*, 2 (1918), No. 1, p. 50).—A description is given of the patho-anatomical changes produced by *B. necrosis*, which organism was isolated from calves and inoculated into rabbits, producing the characteristic pathological picture.

Preliminary report on the virulence of certain body organs in rinderpest. W. H. BOYNTON (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 417-433; *Philippine Jour. Sci., Sect. B*, 13 (1918), No. 3, pp. 127-159).—The authors' experiments show that water extracts of the liver, spleen, and lymph glands 3 days old, a 0.5 per cent phenol extract of the liver, spleen, and lymph glands 5 days old, a 0.5 per cent phenol extract of the cecum and colon 5 days old, a 0.5 per cent phenol extract of heart muscle 5 days old, and 1 per cent phenol extracts of lymph glands 6, 20, and 17 days old, respectively, or of liver, spleen, cecum, and lymph glands 17 days old are highly infectious to susceptible animals. A 0.5 per cent phenol extract of liver, spleen, and lymph glands can hold the virus of rinderpest in a virulent form for periods of time varying from 8 to 55 days. A 1 per cent phenol extract of either liver or spleen 21 days old is virulent to susceptible animals and a 2 per cent phenol extract of spleen 5 days old is infectious.

When glycerin is added to a 2 per cent phenol extract which has been agitated for 48 hours the virus of rinderpest is readily destroyed. It is also destroyed in a 2 per cent phenol extract of lymph glands 8 days old. It is advisable to use a 0.75 per cent phenol extract not over 15 days old.

The larynx, pharynx, and base of tongue, the pancreas, and the skeletal muscle are not suitable tissues for making extracts in the case of rinderpest.

It is deemed very plausible that similar or even better results may be obtained with the virus of hog cholera along these lines. The tissues best adapted for this work are the liver, spleen, lymph glands, heart, fourth stomach, cecum, and colon.

Note on the use of organ extracts in place of virulent blood in immunization and hyperimmunization against rinderpest. W. H. BOYNTON (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 448-455; *Philippine Jour. Sci., Sect. B*, 13 (1918), No. 3, pp. 151-158).—Experimental evidence is given to prove that after any of the customary methods of obtaining virulent rinderpest blood have been used a large amount of additional virulent material can be obtained by extracting the organs in a weak phenol solution, as noted above. From an animal of ordinary size which was bled to death and the organs of which were extracted, 9 liters of blood and 11 liters of extract filtrate were obtained.

Simultaneous immunization and hyperimmunization experiments which were conducted with these tissue extracts showed that the extracts are as potent as virulent blood. If kept at a temperature of 15° C. (59° F.) they can be used with safety in 2,000 cc. doses for hyperimmunization. They should not, however, be given in massive injections if they have been exposed for a period of 18 hours or more to the climatic conditions in the Tropics.

The author considers that the method is also applicable to the production of hog-cholera virus, thereby reducing the cost of the virus.

Observations on the immunity to rinderpest of the Nellore (Indian) cattle and of the various Nellore native grades. S. YOUNGERS (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 436-447, figs. 6).—"The pure Nellore cattle are very highly resistant to the Philippine strains of rinderpest, the mortality being insignificant. They are not, however, absolutely immune. In the case of native cattle, the infectivity of the virus is not appreciably attenuated by being passed through Nellore cattle. This fact makes the latter very dangerous as conveyors of the disease, as they may react without showing clinical evidence. The half-bred Nellore native cattle do not inherit the high degree of resistance to rinderpest possessed by the Nellore stock. In infections of moderate virulence they apparently have somewhat more resistance than the native animals, but in virulent infections this resistance

does not afford them any protection. From the inconclusive evidence at hand the three-fourths Nellore native grades appear to have a greater resistance than the native stock. The rinderpest problem of the Philippine Islands can not be solved by the importation of Nellore or other Indian cattle, unless possibly by carrying it out to the extent of practically eliminating the native stock."

Experiments in the transmission of trichinae. H. B. RAFFENSPERGER (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 3, pp. 363-367).—The results obtained by the author from the experiments here reported upon support the generally accepted opinions that trichinae are not transmissible through the feces, that encysted trichinae are not capable of development when meat containing them is ingested, and that trichinae are spread from one host to another only as a result of the swallowing of meat containing the encysted larvae of the parasites.

"The experiments failed to show that infection with trichinae can be produced by feeding to experimental animals the intestinal stage of the parasites. No infection resulted from feeding meat containing encysted trichinae taken from animals killed 15, 17, and 18 days after infection, respectively, but infection resulted from meat containing newly encysted trichinae taken from an animal killed 21 days after infection."

Studies on the biochemistry and chemotherapy of tuberculosis.—XVI. The pharmacology and toxicology of copper salts of amino acids, H. L. FLOWER (*Jour. Pharmacol. and Expt. Ther.*, 11 (1918), No. 4, pp. 393-429).—Continuing investigations previously noted (E. S. R., 35, p. 181), a study is reported of the acute and chronic toxic properties of copper sulphate and three amino-acid copper compounds, copper glycinate, glutaminate, and leucinate.

The salts showed no variation in action when introduced into the conjunctiva of rabbits. The lower dilutions (1 per cent) produced hyperemia and lacrimation to the same extent, while the higher dilutions were inactive.

Very little variation was shown in the ability to produce acute intoxication when introduced subcutaneously in dilute solutions. The toxic subcutaneous dose of each of the salts was found to be between 4 and 6 mg. per kilogram for guinea pigs. Introduced intracutaneously the different salts showed no variation. The lower dilutions caused necrosis and induration and the higher dilutions little or no change. No variation in action was shown when the salts were introduced subcutaneously or intramuscularly in small gradually increasing doses of from 0.5 to 1 mg. of copper per kilogram for a long period of time. No gross or microscopic changes were noted, but the liver and kidney both showed marked increase in amounts of copper when analyzed. This was also true when various salts were introduced by feeding in small, gradually increasing doses up to 10 mg. per kilogram per day.

The experimental work seems to show that the three copper amino acids examined produce the same physiological effects as a simple inorganic salt, such as copper sulphate.

Observations on trembles (milk sick) in cows, transmitted to man by milk and milk products, H. R. SCHWARZE (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 236-239).—The author reports upon observations of trembles and records two cases of the disease in man, one of which proved fatal, contracted through the consumption of milk taken from affected cows prior to the appearance of any symptoms of the disease.

Prophylaxis and treatment of exudative or contagious bovine pleuropneumonia, J. M. ALEMANY (*Rev. Hig. y Sanitar Pecuarias [Spain]*, 7 (1917-18), No. 9-12, pp. 564-572).—This article includes an historical summary of investigations on contagious bovine pleuropneumonia, a description of the symptoms and

diagnosis of the disease, and a discussion of preventive treatment by vaccination according to the Pasteur method and of therapeutic treatment with various drugs. The author advises obligatory vaccination.

Bovine intestinal coccidiosis (*Vet. Rev.*, 2 (1918), No. 2, pp. 181, 182).—A brief review of recent papers on the subject, with references to the literature.

Isocolibacillosis among calves, M. CHRISTIANSEN (*Maanedsskr. Dyrlægev.*, 29 (1917), Nos. 10, pp. 272-278; 11, pp. 299-313; 12, pp. 324-348).—A report of studies of an enteritis of calves in Denmark caused by isocoli bacilli.

Studies in black disease.—A braxy-like disease of sheep, S. DOVE (*Jour. Compar. Path. and Ther.*, 31 (1918), No. 1, pp. 1-35).—The author considers it quite probable that the disease of sheep in New South Wales known as black disease is identical with the braxy-like disease in Victoria, and with bradset or braxy in Europe, but until the rôle of the bradset or braxy bacillus is established upon a more unassailable footing no definite conclusions can be drawn.

Oxyurosis in the horse, A. RAILLIET (*Vet. Rev.*, 2 (1918), No. 2, pp. 139-157).—This account includes a review of the literature in connection with a bibliography of 53 titles.

The pathology of spavin, S. A. GOLDBERG (*Jour. Med. Research*, 38 (1918), No. 2, pp. 225-265 pls. 2).—Noted from another source (*E. S. R.*, 39, p. 300).

Notes on development of *Oestrus* larvæ in the pharynx of the horse, G. T. CANNON (*Vet. Rec.*, 39 (1917), No. 1523, pp. 107-109, pl. 1).—A report upon two cases of infestation of the pharynx of the horse by *Gastrophilus pecorum*. Its habits resemble those of *G. nasalis*, recent studies of which by Dove have been noted (*E. S. R.*, 39, p. 189).

Strongylidæ in horses, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Par.*, 11 (1918), No. 4, pp. 399-416, figs. 21).—Three forms here described: a new, namely, *Cylicostomum longibursatum*, *C. minutum*, and *C. nasutum parvum*, were taken from horses recently received from the United States.

Horse strongyles in Canada, B. H. RANSOM and S. HADWEN (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 202-214, figs. 16).—Data concerning the nematodes parasitic in the large intestine of the horse found in Canada in 1917, with the exception of species of *Cylicostomum*, are presented. Up to the present time five genera and 26 species have been recognized, of which the following have been collected by the junior author in Canada and are here noted: *Strongylus equinus*, *S. edentatus*, *S. vulgaris*, *Esophagodontus robustus*, *Tetradontophorus serratus*, *T. minor*, *T. intermedius*, *T. tenuicollis*, *T. brevicauda*, and *Gyaloccephalus capitatus*.

Etiology of an infectious disease of foals, H. MAGNUSSON (*Svensk Vet. Tidsskr.*, 22 (1917), Nos. 3, pp. 81-99 figs. 5; 4, pp. 125-147, figs. 2).—An account of an affection of new-born foals caused by an organism to which the name *Bacterium viscosum equi* is given.

An infectious disease of guinea pigs, A. K. GOMEZ (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 511-522, figs. 2).—The author describes a new infectious disease of guinea pigs, the lesions of which are very similar to those of tuberculosis. The causative agent is apparently not identical with any of the organisms known heretofore and has been named by the author *Bacterium pickensii*. A description of the morphological and biological characteristics of the organism is given, and observations of a series of inoculation and feeding experiments conducted on 20 guinea pigs are recorded.

Important poultry diseases, D. E. SALMON (*U. S. Dept. Agr., Farmers' Bul.* 957 (1918), pp. 48, figs. 11).—This is a revision with additions by B. A. Gallagher of Farmers' Bulletin 530, previously noted (*E. S. R.*, 29, p. 885), in which the section on parasites has been revised by W. D. Foster.

Prophylaxis and treatment of diphtheria and contagious epithelioma in hens. C. LÓPEZ (*Rev. Hig. y Sanidad Pecuarias [Spain]*, 7 (1917-181, No. 9-12, pp. 550-563).—This is a general discussion of the subject, under the following headings: Diphtheritic inflammation and pathology; avian diphtheria and its symptomatic manifestations; epithelioma—symptoms, infection, and contagion; the question of identity of avian and contagious epithelioma; prophylaxis; and treatment. The views of various authors on the identity of the two diseases are summarized.

Lead poisoning in waterfowl. A. WETMORE (*Abs. in Jour. Wash. Acad. Sci.*, 8 (1918), No. 11, pp. 374, 375).—A brief account of this affection in wild ducks, whistling swans, and a few other birds which pick up and swallow pellets of shot lying in the mud in marshes and shallow lakes about old shooting birds. These shot are held in the stomach and worn slowly away by grinding against bits of gravel taken to aid digestion, so that small particles of lead are steadily passed out into the intestine and in part absorbed. This causes a severe diarrhea, the feces are stained bright green, the birds are soon unable to fly, and a slow paralysis sets in, so that they become unable to stand.

In experiments conducted six No. 6 shot when swallowed were fatal in every instance, while in one instance one shot of that size was sufficient to cause death from lead poisoning. It was also shown that the trouble was due actually to lead, and not to arsenic or combinations thereof with lead. In all cases this lead poisoning seemed to result fatally, and on certain marshes a considerable number of waterfowl is destroyed in this manner.

RURAL ENGINEERING.

Clearing land. E. D. STRAIT (*U. S. Dept. Agr., Farmers' Bul.* 374 (1918), pp. 30, figs. 13).—Methods of clearing land that have proved successful in the cut-over sections of the United States are here presented briefly. Various methods of burning stumps and different types of mechanical stump pullers are described, the advantages of the use of dynamite are set forth, and approved methods of pasturing stump land to keep down sprouts are outlined.

Softening hard water. II. R. HULBERT (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 82-87).—In continuing the series of articles on hard water previously noted (*E. S. R.*, 33, p. 292) the author discusses chemical precipitation methods for softening hard water and the limitations governing their use under practical conditions.

Public Roads (*U. S. Dept. Agr., Public Roads*, 1 (1918), No. 3, pp. 46, figs. 45).—This number contains data as to Federal-aid road projects approved during May, 1918, and presents several articles and notes dealing with various phases of road construction and maintenance. There are also technical articles entitled *Drainage Increasingly Vital with Growth in Heavy Traffic*, by E. W. James, and *Constructing a Concrete Road at Marine Camp in the Winter*, by C. L. Brown.

Hay caps. H. B. McCURE (*U. S. Dept. Agr. Farmers' Bul.* 377 (1918), pp. 16, figs. 2).—This describes the use of hay caps for the protection of hay curing in cocks, with particular reference to the handling of alfalfa in the corn belt and alfalfa and mixtures of alfalfa and Johnson grass in the South. The kinds of caps and their durability, cost, and storage are discussed.

RURAL ECONOMICS.

Price-fixing and the cost of farm products. H. C. TAYLOR (*Wisconsin Sta. Bul.* 292 (1918), pp. 16, fig. 1).—This bulletin discusses the difficulties in applying the cost principle to price fixing. Data are cited indicating that on the basis

of average cost half the farmers would produce at a loss. It is deemed an open question whether feed should be charged at the cost of production or at the market price, but the total farm profit is recommended as the basis. The combined prices of a group of crops produced on a farm must be enough to make the given type of farming profitable.

Price commissions should study carefully the demands for consumption at the various possible prices and the conditions of production to find what supplies can be produced profitably at the various prices and keep the supply and demand balanced, as a bad system of price regulation may destroy agricultural industries which have required decades to build. A price commission may well act as the medium for collective bargaining in the sale of farm products and in the purchase of supplies. The commission could also "steady prices, guide production, and, in a measure, direct consumption, so that the greatest good may result to all concerned."

Statement in regard to the cost of growing an acre of wheat during the present season compared with the prewar cost (*London: Bd. Agr. and Fisheries, 1917, pp. 2*).—This is an official statement in regard to the cost of growing an acre of wheat in 1917 compared with the prewar cost. The estimated cost in 1913 was £7 7s. 11d. (\$36), and in 1917 it varied from £9 17s. to £11 17s. 2d.

Rural economy in war time, illustrated by official statistics for the first two years of the war, O. H. LARSEN (*Tidsskr. Landökonomi, No. 9 (1917), pp. 389-425*).—This contains a statistical study of prices of agricultural products, together with their influence upon the prices of land. The study covers the period of 1913 to 1916.

Finding labor to harvest the food crops, G. I. CHRISTIE (*U. S. Dept. Agr., Off. Sec. Circ. 115 (1918), pp. 8, fig. 1*).—This circular describes efforts of the U. S. Department of Agriculture in cooperation with other agencies to help the farmers harvest this year the largest acreage of crops in the history of American agriculture. The work of the farm help specialists appointed for practically every State is specially noted. Instances are cited of the successful use of emergency help from towns and cities.

The need of a more permanent supply of labor is pointed out, employment by the year, and greater use of married men being suggested.

Wheat problem of last year's harvest, H. HOOPER (*Northwest, Miller, 114 (1918), No. 11, pp. 851-852, 860-862, figs. 2*).—The author points out how the problem of the harvest of 1917 was met by the Food Administration in providing sufficient bread for the people of the United States and at the same time rendering timely and effective aid to the Allies. He shows how, out of a short crop, an exportable surplus was secured through voluntary cooperation and self-denial.

The food supply and the war (*Albany: N. Y. State Food Supply Com., 1918, pp. 32*).—This is a report of the New York State Food Supply Commission, which endeavored to set in motion forces calculated to increase food production and conservation in the State. It is stated that this commission took stock of the State's resources and established local offices to aid in supplying farm seeds, farm labor, and breeding stock, organized schoolboy labor, promoted conservation of foods, and aided in preventing waste by diseases or in marketing. This report gives details with reference to the methods used in carrying out the above program.

Report of the New York State Food Supply Commission (*Rpt. N. Y. State Food Supply Com., 1917, pp. 148*).—This report contains a summary of the reports of the officials in charge of the various phases of the work in the State.

Report of the food controller, W. J. HAMNA (*Rpt. Food Controller (Canada), 1917, July-Dec., pp. 47*).—The food controller briefly describes food control in

the different European countries and the United States, and the results obtained in Canada under his direction.

The prospects of the world's food supplies after the war. R. H. RAW (*Jour. Roy. Statis. Soc.*, 81 (1918), No. 1, pp. 41-74).—The author fails to see any reason to anticipate, except as the result of an abnormal failure of the world's crop, that the quantity of bread-grain in the world will be insufficient to meet the world's demand, provided it can be transported from the place where it exists to the place where it is wanted. He also concludes that there will be adequate supplies of meat in the world to supply the demands of Europe.

The future position of women in agriculture. J. C. NEWSHAM (*Jour. Farmers' Club [London]*, 1918, May, pp. 67-82).—The author discusses the activities of the members of the Women's Land Army and what use will be made of their services in English agriculture after the war.

A model farm management and credit system. A. R. FOOTE (Washington, D. C.: *American Progress [Publishing Co.]*, 1917, pp. 1711-459).—The author presents a plan to help the farmer obtain credit and at the same time increase his efficiency by a new method of supervision. The plan presented consists of the establishment of financial corporations incorporated and regulated by each of the several States and by the Government of the United States. Part 1 is a statement of the plan of organization, financial structure, and operating details, and part 2 discusses economic and philosophical principles underlying the plan.

A study of farm management problems in Lenawee County, Mich. H. M. DIXON and J. A. DRAKE (*U. S. Dept. Agr. Bul.* 694 (1918), pp. 36, figs. 8).—The basic data here presented were obtained in a survey of 300 owner farms and 153 tenant farms in an area typical of the northern edge of the corn belt.

It is concluded that general farming, with a limited amount of dairying, is the type most easily made profitable in this region. Specialized dairy farms apparently pay better normally than dairy and grain farms, but do not pay so well as the combination of dairying and hog raising. Dairying, with hogs and grain, usually yields a better labor income than any other combination found.

Lewanee County is primarily a live-stock section, and a greater percentage of the income is derived from the sale of live stock and live-stock products than from the sale of crop products. Men with a capital of \$1,000 to \$7,000 make better labor incomes by renting farms than by owning farms, since the rented farms are larger and the tenant can conduct a larger business than if the same amount of capital were divided.

Farm prosperity in Forsyth. E. C. BRANSON (*Winston-Salem, N. C.: Bd. Trade*, 1917, pp. 29).—The author states that the farmers imported \$1,000,000 worth of agricultural products into Forsyth County, N. C., that they might have raised themselves, and also that the cities do not depend on the surrounding farms for supplies. He advises farmers to produce their own food and feed and the cities to organize markets so that they may afford the farmers an opportunity to sell their products at a profit. The author claims that part of the prosperity of the city depends upon the prosperity of the surrounding community.

Our rural society and how to regulate it. A. AGACHE (*Nos Agglomérations Rurales Comment les Aménager*. Paris: *Libr. Construction Mod.* [1918], pp. XXXVI+236, pls. 31, figs. 38).—This book is an analytical study of plans for the reconstruction of rural society in France. The preface, by Georges-Hisler, discusses the "reconstructed-city" plan presented in April, 1916, by President Poincaré and the Secretary of State. The author then deals with the specific problems of the devastated territory in general and how to meet them. Plans are presented for types of villages situated in the North, along the Aisne, the

Meuse, and in the Vosges, with details in regard to streets, public buildings, churches, parks, playgrounds, drainage, sanitation, slaughterhouses, etc. There are also plans for the building up of evacuated villages, among which may be mentioned Vailly (Aisne), Templeuve (North), Parois, Sommedieuve, and Revigny (Meuse), and a theoretical plan for the new village of Joffreville, situated at the crossroads of a national and a departmental highway.

Characteristics of the districts and their influence on rural enterprises. G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ.*, 9 (1917), Nos. 97, pp. 44-55; 98, pp. 120-130; 99, 221-232; 100, 314-325; 101, 406-416; 102, 488-498; 103, 602-612; 104, 685-694; 105, 796-799).—In this article the author has defined the salient agricultural conditions and general characteristics of each of the eight main districts into which rural Spain is divided, and the influence that these characteristics have had, both on their economic separation, due to lack of transportation and other facilities of communication and on the methods of exploitation of the land. The author advises the improvement of agricultural methods and their official supervision. With a federation of these districts and better methods of communication, he feels that much may be accomplished toward improving the country as a whole.

Proceedings of the permanent committee of the International Institute of Agriculture (*Inst. Internat. Agr. [Rome], Comité Permanent Proc. Verb.*, 1917, pp. VIII+467, fig. 1).—This is a report of the proceedings of the meetings held monthly during 1917, at which the various committees and international delegates reported on administrative matters of the institute.

Report of the executive committee of the commonwealth advisory council of science and industry, covering the period from the date of the appointment of the executive committee (14th April, 1916) to the 30th June, 1917 (*Aust. Advisory Council Sci. and Indus., Rpt. Exec. Com.*, 1917, pp. 15-29).—Among the topics considered by this committee (E. S. R., 39, p. 3) under this heading are the control and eradication of pests and diseases of crops and the utilization of native forest and vegetable products and fisheries.

A community center.—What it is and how to organize it. H. E. JACKSON (*U. S. Bur. Ed. Bul.* 11 (1918), pp. 52, pls. 2).—Part 1 of this bulletin discusses broadly the purposes and functions of the various departments of the community center. The main features noted are the open forum, the community bank for short-time credits and for long-time credits on the amortization plan, and the buying club or cooperative exchange. Part 2 deals with details of organization and the benefits resulting from a community center. Part 3 contains a constitution prepared for a community center in Washington, D. C. and also a suggested constitution.

Annual statistical report of the New York Produce Exchange for the year 1917 (*Amer. Statis. Rpt. N. Y. Produce Ex.*, 1917, pp. 139).—This report continues the data previously noted (E. S. R., 37, p. 891) by adding data for 1917.

Production [in New Zealand] (*Statis. Dominion New Zeal.*, 3 (1915), pp. 1-114; 3 (1916), pp. 1-120).—These reports continue data previously noted (E. S. R., 35, p. 795), giving statistics for the years 1915 and 1916.

AGRICULTURAL EDUCATION.

Agricultural education in South Africa. A. I. PEROLD (*So. African Jour. Sci.*, 14 (1917), No. 5, pp. 201-209).—The author outlines briefly the history of agricultural instruction in South Africa since the giving of the first courses in 1887, the present facilities for such instruction, criticisms and suggestions for their improvement, and present and future needs.

There are at present five schools of agriculture, with experiment farms, offering 2 and 3 year diploma courses, a 1-year course, and short winter courses.

The subjects of instruction in these schools are animal and field husbandry; elementary botany, chemistry, geology, and zoology; agricultural botany, chemistry, and zoology; veterinary science; entomology; poultry husbandry; dairying; agricultural engineering and building construction; agricultural law and economics; horticulture; and viticulture and wine making (at Elsenburg only). Carpentry, general blacksmithing, and horseshoeing and harness making are taught as purely practical subjects. More than one-half of the student's time is devoted to practical work. Every student must take the full course, except in the 3-year diploma course, where one major and two minor subjects may be chosen.

The latest development in agricultural education has been the founding in 1917 of the two agricultural faculties at Stellenbosch and Pretoria, respectively, which will be integral parts of the Victoria College (the future University of Stellenbosch), and the Transvaal University College, under the future University of South Africa. The subject of agriculture is practically not to be found in the curricula of the primary and secondary schools. A little nature study and agricultural science are taught here and there.

Agricultural education in Australia. C. F. JENNIX (*So. African Jour. Sci.*, 14 (1917), No. 5, pp. 310-231).—This is a report of a visit of inspection to some of the agricultural education institutions and experiment stations in Australia. It deals with the functions, equipment, etc., of the Roseworthy Agricultural College, farm bureaus, and experimental farms in South Australia; the Werribee Central Research Farm and other experiment farms and agricultural training in Victoria; the model education system, Hawkesbury College and experiment farms in New South Wales; and the colleges and experiment stations of Queensland.

Agricultural colleges exist in all the States except Western Australia, where a chair of agriculture has been provided in the University of Western Australia. Attention is called to the thoroughly practical character of Australia's agricultural education institutions, which aim to evolve farmers and not quasi-scientists, and to the fact that the bulk of the students come from the mercantile and professional classes. In almost every State instruction classes are available for those already actively engaged in farming, but the scattered population is given as the cause of these classes not being up to the United States standard.

The teaching of agriculture. A. W. NOLAN (*New York: Houghton Mifflin Co.*, 1915, pp. I+277).—The author discusses some reasons for teaching agriculture, the specific aims of vocational agricultural education for the individual student, and the social aims in view of modern demands, such as the conservation of natural resources, greater efficiency in rural life vocations, conservation and improvement of health in rural life, a greater appreciation of art, moral growth, rural organization, and liberal education, to which agriculture in its threefold aspect—as an industry, a business, and a life—comes with large contributions. Three main groups of rural problems, viz, the problems of farm improvement, of marketing and exchange, and of community life are stated to show a line of approach or a point of view in teaching agriculture.

Chapters are devoted to (1) nature study preceding agriculture, including guiding principles in the selection of materials and in the teaching of nature study in the grades, and suggestions for teaching the subject in grades one to six, inclusive; (2) elementary agriculture and boys' and girls' club work beginning with the seventh grade and including some suggestions as to content of courses and textbook and home project club methods; (3) high school agriculture, in which are discussed such curriculum problems as the purposes of the

course, time to be given to it, fitting the work into a unified science course, and the organization and presentation of subject matter, including suggested outlines for a 3-year junior high school agricultural course and a senior high school agricultural course comprising two units of high school work in agronomy, animal husbandry, and general horticulture, special elective courses in agriculture for one-half unit credit for the junior and senior years in soils, the farm physical plant or farm engineering, farm management, plant and animal improvement, poultry husbandry, dairy husbandry, and vegetable gardening; also of a 1-year high school general course in agriculture including home projects. Suggestions for teaching the subjects, practical field and laboratory exercises, and lesson plans accompany the outlines for the senior high school. (4) Some methods and principles in teaching agriculture, including a discussion of the science of agriculture and farm practice, the use of the textbook, lecture, and laboratory methods, reports and class recitations by students, teaching farm craft, home projects in secondary school agriculture, supervised farm practice under the Smith-Hughes Law, the use of reference material and system of filing, agricultural extension in the high school, and the use of land in teaching agriculture in secondary schools; and (5) the teacher of agriculture as the most important factor.

Appendixes contain suggestions for a farm, home, and community survey; an outline of a suggested course in nature study for the first six grades, and of a suggested course in the elements of agriculture for the seventh and eighth grades by the textbook method and the home project plan; suggestions for laboratory equipment; and extracts from the Smith-Hughes Law relative to the training of agricultural workers and the Texas plan under the Smith-Hughes Law. A bibliography of secondary school agriculture is included.

The variation in elementary courses in agriculture, J. McCaig, S. E. LANG, L. A. DEWOLFE, S. LAIRD, J. B. DANDENO, and A. W. COCKS (*Agr. Gaz. Canada*, 5 (1913), Nos. 3, pp. 286, 287; 4, pp. 375-381).—This is a series of articles by agricultural education officials with reference to the service rendered by the various agencies of education in the field of agriculture in Nova Scotia, Quebec, Ontario, Manitoba, and Saskatchewan, in reply to an article from the Province of Alberta suggesting that there would be an advantage in a discussion by the various Provinces of the right functioning and proper province of the different grades of teaching institutions dealing with the subject of agriculture, and outlining the practice in Alberta. An examination of the courses in the different Provinces, it is stated, shows a wide variation in their content and general purposes or use. The elementary schools all have incorporated in their courses considerable bodies of work with an agricultural basis variously called nature study, rural science, elementary science, or agriculture.

Elementary agriculture for Virginia schools, E. A. MILLER (*Richmond, Va.: State Dept. Pub. Instr., 1918, pp. 143, figs. 27*).—This is a series of lessons in elementary agriculture, outlined by months, for the public schools of Virginia. Each lesson topic includes helps for teachers, a lesson outline, references, illustrative material, practical exercises, and correlation suggestions. Copies of the essentials of the different record books for Virginia are supplemented to assist teachers in familiarizing themselves with the rules governing and the reports required of clubs.

Farm machinery laboratory manual, D. SCOTATES (*Agricultural College. Miss.: Author, 1918, 2. ed., pp. 98*).—This is a second and enlarged edition of this manual, which has been previously noted (*E. S. R.*, 30, p. 795). It consists of exercises in the examination of machines from an investigational standpoint, taking them apart and reassembling and testing them.

Fairs and their educational value, S. G. RUMROW (*N. C. Agr. Ext. Serv. Circ. 69* (1918), pp. 14, figs. 5).—The author discusses the early history and development of fairs, their popularity and usefulness, and the value of their prominent educational factors—exhibits, contests, competitive entries, demonstrations, lectures, and entertainment features—which when properly correlated, each in its proportionate place, are deemed to make up the modern agricultural fair.

The organization and management of fairs, S. G. RUMROW (*N. C. Agr. Ext. Serv. Circ. 68* (1918), pp. 24, figs. 12).—The problems of fair organizations, such as the location, grounds, buildings, public comfort, exhibits and entries, judging programs, fair catalogues, special committees, advertising, concessions, finances, etc., are discussed.

School pupils for farm work (*Agr. Gaz., Canada, 5* (1918), No. 4, page 375).—This is a series of statements by provincial education officials in the outlining the arrangements made by the departments of education in Edward Island, Nova Scotia, Ontario, Manitoba, Saskatchewan, and St. John's County, to prevent boys who enlist for work on farms from losing their schooling. Frank P. The Canada Food Board called for the enlistment of 25,000 boys of horticultural, as the various Provinces provided machinery for placing the boys on farms. The boys giving three months of satisfactory service on the farm, Wisconsin, bronze national honor badge, and were paid regular wages by the State, amount of work which they were capable of doing.

Camp Liberty: A farm cadet experiment, JEAN L. HUNT and J. C. (Bur. Ed. Expts. [N. Y.], *Bul. 7* (1918), pp. 24, figs. 9).—This is a detailed farm-labor experiment in which 25 young men from New York City, son was a of a New York State community, and the Bureau of Education, degree from cooperated in the summer of 1917. The economic and educational value of the experiment is considered, and it was found that the irritating factors and elements of animal satisfaction felt by all concerned in the experiments were for the most part, seven the economic side.

In conclusion, it is believed evident that city boys can not be employed on farms to any better advantage than under such an arrangement where the boy's life secures personal happiness and independence, and work is done in the field, two, three, and four under the farmer's supervision. Further, it is believed that Camp Liberty was economically as successful as were camps where no considerable educational program was undertaken. If local circumstances had not made a 10-hour working day imperative, educational activities could have been further stressed. The environment was educative in itself, and in spite of limitations it is believed that Camp Liberty succeeded in providing a life experience of value of which to city boys and to their future citizenship is hardly to be measured in immediate returns.

From its experience the bureau is inclined to doubt whether the boys' camp for farm labor can be advocated as an economic remedy of wide application in present emergencies. The farmer can be expected to use it only when other labor is unobtainable or in specially favored localities where conditions permit some adjustment of the economic dissatisfaction described. On the other hand, as a permanent feature of our educational institutions, the bureau heartily advocates the further development of such enterprises and considers that such units would be a national asset if undertaken each season in numbers sufficient to affect an appreciable percentage of city youth.

The President to the farmers of America (*U. S. Dept. Agr., Off. Sec. Circ. 114* (1918, pp. 6, 7).—Extracts from the President's message to the Farmers' Conference at Urbana, Ill., January 31, 1918, are cited.

NOTES.

Arizona University and Station.—F. J. Crider, associate horticulturist of the South Carolina College and Station, has been appointed professor of horticulture and head of the horticultural department.

California University and Station.—Additional emergency courses offered by the College of Agriculture this fall included a course in machine milking for women, given at the request of the Woman's Land Army of America, and two

(4) courses for women, the object of which was to train leaders for groups of agricultural workers.

A statement was recently made that during the past five years 1,684 incoming farm State prison at San Quentin have availed themselves of the correspondence courses offered in agriculture. Members of the college staff have of filing, at the institution at least monthly to deliver lectures on some phase of agriculture. An agricultural club, with about 300 members, is an active organization in the institution.

Appendix: Hansen, instructor in agricultural extension, A. R. Sprague, as outline of agricultural extension, and M. R. Miller, assistant chemist in the suggested laboratory, have resigned. Leave of absence has been granted to grades by Noel, associate professor of agricultural education, and W. F. laboratory at professor of soil chemistry and bacteriology, the former to training of assistant director of agriculture for the State vocational education Law. A brief latter for graduate study.

The varying, a member of the agricultural advisory board of the U. S. L. A. DeWolf, has been appointed a regent of the university. Recent 5 (1918) in the university include R. N. Wilson and Miss Lillias D. agricultural instructors in agricultural extension; Earl M. Dobbs, Harold E. various and Woodbridge O. Johnson as assistants in agricultural extension; Ontarioight as assistant in entomology in the citrus substation at Riverside, of Alb. Blythe F. Monroe as assistant in soil technology.

various are College and Station.—Dean Hayward has been given leave of absence for a year to serve as regional director of agricultural education in Illinois under the U. M. C. A. Army Overseas Educational Commission.

Pr. C. Whittler has been appointed chemist of the station. W. J. Young, assistant horticulturist, has resigned to become associate horticulturist at Clemson College.

Idaho University and Station.—C. W. Hickman, associate professor of animal husbandry, has been appointed professor and head of the department. O. E. Connell has been appointed instructor in animal husbandry and assistant in the station.

R. E. Neldig, associate chemist, has been appointed professor of chemistry in the college and chemist of the station. Miss Lulu Vance has been appointed analyst in agricultural chemistry.

Robert K. Bonnett, assistant professor of farm crops at the Kansas College, has been appointed professor of farm crops and head of the department, beginning September 1. Dr. V. H. Young, assistant pathologist in the Office of Cotton, Truck, and Forage Crop Disease Investigations, of the U. S. Department of Agriculture, has been appointed professor of botany and head of the department.

Purdue University and Station.—E. G. Proulx has been appointed State chemist, and Miss M. Briggs, deputy State chemist. Dr. R. H. Carr has been appointed associate chemist of the station.

H. A. Noyes, bacteriologist and soil chemist for the department of horticulture, has resigned to accept a position with the Mellon Institute of Industrial Research. R. S. Stevenson, instructor in animal husbandry, has accepted a similar position with the Manitoba Agricultural College. E. J. Wilford, instructor in animal husbandry, has accepted a position as instructor and assistant in animal husbandry at the Kentucky University and Station. H. M. Weeter, assistant professor of dairy bacteriology and associate dairy bacteriologist, R. A. Lamson, instructor in dairy husbandry, and E. J. Petry, instructor in agronomy, have also resigned to accept positions elsewhere. J. C. Beavers, associate in soils and crops extension work, has resigned to engage in farming in North Carolina. C. H. Clink, assistant in serum production in the veterinary department, died September 17.

Recent appointments include M. H. Overton, county agent of Adams County, in the farm management division of the extension department; Frank P. Cullinan, of the school of agriculture, as a member of the department of horticulture in the station; and William Aitkenhead, of the school of agriculture, as farm mechanics specialist for the station.

Iowa College and Station.—Dr. E. D. Ball, State entomologist of Wisconsin, has been appointed chairman of the department of zoology and entomology, entomologist of the station, and State entomologist.

Kansas College and Station.—B. O. Severson, associate professor of animal breeding and in charge of animal breeding investigations since September 1, died December 4 of influenza, at the age of 31 years. Professor Severson was a graduate of the University of Wisconsin, had received the master's degree from the Pennsylvania College, and was engaged in completing work for the doctor's degree at the University of Illinois. He had been a member of the animal husbandry department at the Pennsylvania College and Station for about seven years, being engaged largely in work relating to the breeding and maintenance of beef cattle and sheep.

A department of agricultural economics has been established in the division of agriculture, and Dr. Theodore Macklin, recently on leave to serve as land specialist on the Poheny Research Foundation, has been appointed head of the department. Investigational and instructional work in farm management has been transferred from the department of agronomy to the new department, with W. E. Grimes, assistant professor of farm management immediately in charge.

E. F. Ferrin, associate professor of animal husbandry at the Iowa College, has been appointed associate professor of animal husbandry. He will be in charge of swine investigations at the station, as well as of instruction work in the department of animal husbandry, notably that pertaining to pork production.

H. W. Cave, specialist in dairy husbandry at West Virginia University, has been appointed assistant professor of dairying, and F. W. Atkeson, assistant in dairy husbandry at the college and station. Dr. Helen Bishop Thompson has been appointed dean of home economics and professor of nutrition.

Kentucky University and Station.—Recent appointments include Mark Havenhill as professor of farm mechanics, F. J. Sutton as assistant professor of horticulture, L. J. Horlacher as instructor in animal husbandry and assistant in the station, Miss Jean G. MacKinnon as acting head of the teaching division of home economics, and Miss Margaret Coffin as assistant professor of home economics.

Massachusetts College.—In order to clear up all possibility of doubt as to the exact legal status of the institution (E. S. R., 38, p. 307), a law enacted at the last session of the legislature dissolved the college as incorporated in 1883 and reincorporated it under the previous name but as a definitely State institution. The State is given full control of its activities and assumes liability for any indebtedness. The previous trustees were continued for their present term of office, all subsequent appointments being made by the governor and council as formerly. All college employees are considered to be State employees, although not included under the civil service laws.

President Butterfield has sailed for Europe in connection with his duties as a member of the Y. M. C. A. Army Overseas Educational Commission, appointed by the War Work Council of the Y. M. C. A. The object of this commission is to provide educational opportunities for soldiers in the American Expeditionary Forces. A staff is being selected, largely from the faculties of American colleges and universities, and a comprehensive program in which agriculture has an important place is being projected. The work is expected to be largely of an extension nature, and to be continued during the period of demobilization.

R. W. Redman, of the Office of Extension Work North and West of the States Relations Service, U. S. Department of Agriculture, has been appointed assistant director of the extension service and has entered upon his duties. John Phelan has been appointed director of short courses.

Minnesota University and Station.—Dr. L. I. Knight, of the University of Chicago and the West Virginia Station, has been appointed professor of plant physiology and plant physiologist of the station, effective January 1, 1919. Lavinia Stinson has been appointed instructor in foods and cookery, and John Severin, instructor in farm motors at Crookston. B. M. Gile has been appointed State supervisor of vocational agricultural education. Benjamin Cole has resigned as live stock marketing agent in agricultural extension.

Missouri University and Station.—V. R. Gardner, pomologist of the Oregon College and Station, has been appointed professor of horticulture. C. C. Wiggins, assistant professor of horticulture, has resigned to accept a research position at the Delaware Station beginning October 1, and has been succeeded by H. G. Swartwout as instructor in horticulture. W. H. Lawrence has also resigned as assistant professor of horticulture.

Dr. G. M. Reed has resigned as botanist to accept a position with the U. S. Department of Agriculture. L. G. Rinkle, assistant professor of dairy husbandry, has resigned to become food and dairy commissioner of Kansas City, and has been succeeded by W. B. Combs, instructor in dairy husbandry at Rutgers College. E. L. Dakan, assistant in poultry husbandry, has also resigned.

O. W. Weaver, of the Florida University and Station, has been appointed agricultural editor. D. J. Griswold, jr., has been appointed research assistant and instructor in animal husbandry. Other appointments include W. E. Ford, specialist in farm management demonstration at the Colorado College, as farm management demonstrator in the extension service; F. T. Kraege as assistant in agricultural extension to direct a silo campaign; C. C. Hamilton as extension instructor in entomology; and F. W. Caldwell, assistant professor of veterinary science in the extension service, as county agent for Lafayette County.

Montana College and Station.—E. J. Quin has been transferred from research chemist of the station to assistant professor of chemistry in the college, in charge of courses in analytical and agricultural chemistry.

New Jersey College and Stations.—A department of rural engineering has been established in charge of Leslie E. Hazen. His work is to be divided between teaching in the long and short courses in agriculture and extension work in rural engineering. Demonstration work with farm tractors is expected to be an important feature of the department's activities.

During the past season the area of land under the direction of the college farm management has been increased from 350 to 600 acres. This addition has been brought about through the action of James Nelson, a member of the board of trustees, who has turned over his farm adjoining that of the college for the use of the institution.

The New Jersey College for Women opened its doors for the first time this fall with a very satisfactory enrollment. The college campus is situated near the Rutgers College farm and the agricultural buildings will be used to a considerable extent by the women's college, the short course buildings being remodeled for work in home economics.

The department of home economics has been cooperating for some time with the horticultural department in an experiment at the station orchard at Vineland. The object is to determine whether a commercial fruit grower can profitably conduct a plant for use in connection with his orchard to dispose of the cull stock of peaches through canning, drying, preserving, etc.

The experimental cranberry investigations, including tests of fertilizers, drainage, and insect control have been summarized, and with these data as a basis a new project on various phases of cranberry culture has been begun in charge of C. S. Beckwith, assistant entomologist.

Other changes in staff include the resignations of Alva Agee, State superintendent of farm demonstration; W. H. Hamilton, assistant State leader of farm demonstration; A. K. Getman, State assistant in agricultural education; W. B. Combs, assistant dairy husbandman; and W. J. Stoneback, assistant chemist. Recent appointments include the following: Geo. D. Musgrave as assistant professor of agronomy, Dr. S. A. Waksman as microbiologist, Miss Gertrude E. Macpherson as assistant plant pathologist, John Hill and Forrest Button as assistant dairy husbandmen, H. O. Sampson as State assistant for agricultural education, Van E. Leavitt as extension specialist in fruit growing, and Miss Elsie Dittman as emergency assistant State club leader.

New Mexico College and Station.—The new dairy and beef cattle barns have been completed and the sheep, hog, and horse barns are nearly ready for occupancy. Experiments in the feeding of Yucca to range cattle, having in view primarily the determining of its nutritive value, have been resumed. Plans have also been completed for an experiment in pasturing range cattle on the native schad scale (*Atriplex canescens*) in order to ascertain its feeding value as a maintenance emergency feed.

O. C. Cunningham, field agent of the Bureau of Animal Industry of the U. S. Department of Agriculture, was appointed head of the dairy department of the college, effective September 1. J. G. Griffith has been appointed in charge of the department of biology, with Leon H. Leonian as assistant biologist. R. H. France has been appointed assistant in the department of irrigation, and W. V. Homan assistant in the poultry department.

Cornell University.—Dr. Andrew Dickson White, first president of the university from its establishment in 1867 to 1885, and widely known throughout the world in educational and diplomatic circles, died at Ithaca, November 4, at the age of 86 years.

William J. Wright has been appointed State leader of junior extension to succeed F. L. Griffin, who has accepted a position as associate professor of agricultural education in the University of California.

North Dakota College and Station.—The work of the institution is being reorganized to bring the college, station, and extension divisions into closer affiliation with the department as a working unit. J. H. Shepperd, formerly in charge of the station department of agriculture, has been made chairman of the newly organized department of animal husbandry. Professor Shepperd will continue to give the major portion of his time to station work, but along the line of investigations in animal husbandry. E. W. Christensen, who has had charge of the college work in animal nutrition, will take over the station investigations in that subject.

The dairy department has been reorganized with J. R. Keithley as chairman. The management of the dairy herd has been placed in charge of this department.

Other departments will be reorganized during the year.

Oregon College and Station.—The new horticultural products building was opened for occupancy this fall. This building has a complete equipment of machinery and apparatus for testing and demonstrating methods of canning, drying, and preserving horticultural products, including blanching boxes, canning tables, exhaust boxes, double steamers (pressure cookers), a 20-gallon steam jacketed aluminum kettle, a 10-gallon tilting jelly kettle, a complete tunnel drier, 3 tunnels, and a kiln drier, a prune table, sulphuring boxes, peeling and paring machines, and slicing machines.

The new \$115,000 library building has also recently been opened for use.

As the results of experiments carried on at the Southern Oregon Sub-station, at Talent, it has been demonstrated that the proper use of sulphur in the soil greatly increases the production of alfalfa. The county agent for Crook and Deschutes Counties reports the organization of a farmers' pool for ordering 185,000 lbs. of sulphur for fertilizing purposes. This is expected to be applied to more than 2,000 acres of alfalfa.

It is announced that the so-called Oregon hens, originated at the station several years ago, have won first place in the latest 52-week international egg-laying contest at the Connecticut College, and have also broken the international contest record by 92 eggs, the total number of eggs laid by the 10 hens being 2,352.

A meeting of western horticulturists was held at the college August 5 to 9. A permanent organization was effected and plans made for annual meetings hereafter. The 1919 meeting is expected to take place at the Washington College, the University of Idaho cooperating. The members of the horticultural staff of the institution at which the meetings are to be held are to act as executive officers.

A number of changes have recently taken place in the staff of the division of horticulture. L. F. Lingle, horticultural assistant in horticultural products investigations, has resigned to take up a study of canned fish in the U. S. Department of Agriculture, and has been succeeded by H. W. Allinger. Dr. E. J. Kraus, research specialist, has become dean of special arts and sciences, and has been succeeded by E. M. Harvey. Geo. Crosswell has been appointed orchard foreman, and A. E. Murneck, research assistant.

Pennsylvania College.—F. Theodore Struck, supervisor of vocational education for Essex County, N. J., has been appointed associate professor of agricultural education.

Tennessee Station.—L. G. Willis, assistant chemist, has resigned to become chemist of the Porto Rico Station. J. B. Young and F. C. Grannis have been appointed assistant chemists.

Texas Station.—J. M. Jones, for several years in charge of animal husbandry work with sheep and goats, has been appointed assistant director as well as

chief of a new division of animal industry, formed by the merging of the divisions of dairying and poultry husbandry. J. C. Burns, for many years in charge of cattle feeding investigations, has been granted leave of absence to take up work with the Bureau of Animal Industry of the U. S. Department of Agriculture and the extension service as special agent of the Bureau in the movement of cattle from the drought-stricken regions of the western country to eastern ranges and feeding places. R. N. Harvey has resigned as poultryman in order to return to New York to take up farming.

E. A. Miller has resigned as superintendent of Substation No. 3, Angleton, to take up work in horticulture with the extension service at the college, and has been succeeded by E. B. Reynolds, formerly associate professor of agronomy. N. E. Winters, superintendent of Substation No. 10, the feeding and breeding station, has resigned to engage in extension work in agronomy at the North Carolina College, and has been succeeded by J. W. Jennings.

Utah College and Station.—An agricultural engineering experiment station was formally established December 2, as an integral part of the institution. The new station will be organized into five experimental divisions, including irrigation and drainage, roads, farm machinery and transportation, manufacture of agricultural products, and rural architecture and buildings.

A new irrigation and drainage building is being erected. Reuben L. Hansen has been appointed assistant in irrigation and drainage work in connection with the college and station. Dr. D. S. Jennings has been appointed to take charge of the soil survey work in the State.

Washington College and Station.—E. C. Johnson, dean of the division of extension at the Kansas College, has accepted an appointment as dean of the college of agriculture and director of the station, effective January 1, 1919.

States Relations Service.—Milton D. Moore, for several years associated with *Experiment Station Record* in connection with the abstracting in dairying and animal husbandry and the preparation of indexes, has resigned to become emergency demonstration agent in Laurens County, S. C. Miss M. Lenore Flint and Miss Louise B. Pritchett, associated respectively with the abstracting in rural economics and food and nutrition, have been succeeded by Miss Louise Marbut and Miss Elizabeth B. Bower.

F. E. Heald, in charge of the work in agricultural instruction in schools, has become agent for the State Vocational Education Board of Massachusetts, in charge of teacher training activities and with headquarters at the Massachusetts Agricultural College. He has been succeeded by Alvin Dille.

Dr. A. D. Holmes, acting assistant chief of the Office of Home Economics, has resigned to engage in commercial work.

L. A. Clinton, assistant chief of the Office of Extension Work in the North and West, has been appointed in charge of extension work in New Jersey, and has been succeeded by C. E. Gunzels, director of the extension service, University of Nebraska.

Khaki University.—President G. C. Creelman, of the Ontario Agricultural College, has been overseas for some time in the interest of agricultural instruction in Khaki University. This institution, a brief note of which has been previously given (E. S. R., 38, p. 700), is a peripatetic institution designed for the instruction of men at the front who had commenced their work in Canada. Already 20 lecturing centers in England and France have been organized, and a first year course in agriculture begun, and additional courses are to be arranged with eventual credit on the student's return to college in Canada. Instruction is also provided for men desiring short practical courses.

From October, 1917, to July, 1918, about 9,000 men had enrolled in all departments. The Dominion Government has voted about \$500,000 for main-

tenance of the institution and the Y. M. C. A. has promised about as much more. The head of the work is Dr. H. M. Tory, president of the University of Alberta, and the staff has been recruited largely from the Canadian military forces. Because of the practical difficulties encountered but little of the work as a whole, it is stated, is of real university grade.

National Institute of Agricultural Botany at Cambridge University.—According to a recent announcement by the president of the Board of Agriculture and Fisheries of Great Britain, active steps are being taken to establish a National Institute of Agricultural Botany at Cambridge University. This institute will be modeled on the plan of the Swedish plant breeding station at Svälöf, with its primary purpose the breeding and distributing of improved varieties of agricultural crops.

The possibilities of such an institute were outlined in a speech to the House of Commons by Hon. R. E. Prothero, president of the Board of Agriculture and Fisheries, in which he pointed out its worthiness as a field for private assistance. "If any millionaire is to survive the vigilance of the Chancellor of the Exchequer he can not do better than to turn his attention and his money to the Plant Breeding Institute at Cambridge and to the Institute of Applied Botany which we are endeavoring to found there, and I believe that he would confer a great boon upon the agriculture of this country."

Subscriptions aggregating about \$180,000 have been received for the purpose, including the sum of \$50,000 immediately and \$5,000 a year for five years from a commercial firm, and \$25,000 from the Incorporated National Association of British and Irish Millers. It is announced that the Board of Agriculture and Fisheries will provide the necessary buildings and equipment.

Miscellaneous.—The Imperial College of Science and Technology is to reorganize its department of chemical technology to meet more adequately the changed conditions due to the post-war situation. An important section is to deal with the technology of carbohydrates, fats, oils, and rubber.

The agricultural advisory committees of the Ministry of Food and the Board of Agriculture and Fisheries of Great Britain have been amalgamated into central agricultural advisory committee, with Lord Selborne as chairman.

Nature announces that a war relief fund for restoring the gardens and orchards in France, Belgium, and Serbia, which have been destroyed by the Central Powers, has been opened by the Royal Horticultural Society, for which contributions are being received by the honorary treasurer, Sir H. Veitch.

The grants in aid of agricultural research in Great Britain, mainly from the Development Fund, are estimated at £20,450 (approximately \$100,000), for the fiscal year ending March 31, 1919.

Laval University of Quebec has conferred the degree of doctor of agricultural science on J. H. Grisdale, acting deputy minister of agriculture and director of experimental farms, and A. T. Charron, chief chemist of the Province of Quebec and director of the provincial laboratories. Dr. C. D. McGillivray lecturer and instructor in veterinary science at the Manitoba Agricultural College, has been appointed principal of the Ontario Veterinary College, vice Dr. E. A. A. Grange, resigned.

Dr. W. J. Spillman, chief of the Office of Farm Management, U. S. Department of Agriculture, has resigned to become editor of the *Farm Journal*.

